1958.

QUEENSLAND.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE AND STOCK

FOR

THE YEAR 1957-58.

PRESENTED TO PARLIAMENT BY COMMAND.

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ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1958.

SECRETARY FOR AGRICULTURE AND STOCK .. .. Hon. O. O. Madsen, M.L.A.

CENTRAL ADMINISTRATION—

Under Secretary .. .. W. A. T. Summerville, D.Sc.
Assistant Under Secretary (Technical) .. .. W. Webster, B.V.Sc.
Assistant Under Secretary .. .. W. T. Gettons, A.I.C.A.
Special Administration Officer .. .. H. Barnes.
Officer in Charge, Information Services .. .. C. W. Winders, B.Sc.Agr.
Accountant .. .. E. C. R. Sadler, A.A.U.Q.

DIVISION OF PLANT INDUSTRY—

Director of the Division .. .. W. G. Wells.

Agriculture Branch—

Director of Agriculture .. .. W. J. S. Sloan, M.Sc.Agr.

Regional Experiment Stations Branch—

Director of Regional Experiment Stations .. .. W. J. Cartmill, M.Sc., A.R.A.C.I.

Horticulture Branch—

Director of Horticulture .. .. S. A. Trout, M.Sc., Ph.D.

Science Branch—

Sections of Botany (S. L. Everist, B.Sc., Government Botanist); Entomology (W. A. McDougall, D.Sc., Chief Entomologist); and Plant Pathology (J. H. Simmonds, M.B.E., M.Sc., Chief Pathologist).

Chemical Laboratory—

Agricultural Chemist .. .. C. R. von Stieglitz, F.R.A.C.I.

DIVISION OF ANIMAL INDUSTRY—

Director of the Division .. .. Vacant.
Assistant Director .. .. A. L. Clay, B.V.Sc.

Veterinary Services Branch—

Director of Veterinary Services .. .. .. C. R. Mulhearn, B.V.Sc.

Pathology Branch—

Chief Pathologist .. .. L. G. Newton, B.V.Sc.

Animal Husbandry Research Branch—

Chief Husbandry Officer .. .. J. W. Ryley, B.V.Sc.

Sheep and Wool Branch—

Director of Sheep Husbandry .. .. A. T. Bell, B.V.Sc.

Cattle Husbandry Branch—

Director of Cattle Husbandry .. .. .. D. N. Sutherland, B.V.Sc.

Pig and Poultry Branch—

Director, Pig and Poultry Branch .. .. .. A. L. Clay, B.V.Sc.

Biochemical Branch—

Biochemist .. .. J. M. Harvey, D.Sc., A.R.A.C.I.

DIVISION OF DAIRYING—

Director of Dairying .. .. E. B. Rice, Dip.Ind.Chem.

Field Services Branch—

Director of Field Services .. .. F. C. Coleman, Q.D.A.

Research Branch—

Director of Research .. .. L. E. Nichols, B.Sc.Agr., A.R.A.C.I.

DIVISION OF MARKETING—

Director of Marketing .. .. H. S. Hunter.

Economics Research Branch—

Director of Economic Services .. .. C. H. P. Defries, H.D.A., B.Com., A.F.I.A.

Standards Branch—

Standards Officer .. .. A. A. Ross, M.Agr.Sc.

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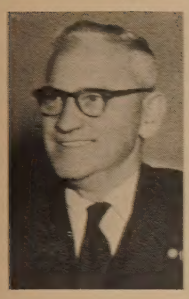
REPORT OF THE DEPARTMENT OF AGRICULTURE AND STOCK FOR THE YEAR 1957-58.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.



Dr. W. A. T. Summerville.

Dear Sir,—I have the honour to present a report of the activities of the Department of Agriculture and Stock for the year 1957-58.

In doing so, I must refer first of all to the sudden death in May of Mr. A. F. Bell, who had been permanent head of the Department since July, 1947. The Annual Reports of the past decade contain ample evidence of the great expansion, both in scope and in scale, of Departmental services during Mr. Bell's term of office as Under Secretary. They reveal only in part, however, the personal influence exerted by him on the organisation and activities of the Department and its status among primary producers and the community generally.

Mr. Bell joined the Department as a cadet in 1916 and served it with a steadily increasing measure of responsibility as a professional officer, becoming Director of the Bureau of Sugar Experiment Stations in 1945. He subsequently assumed and discharged with distinction the heavy administrative duties of the position occupied at the time of his death. To this position he brought a firm and forthright approach and a broad outlook. As a scientist, he made valuable contributions to agriculture, particularly in the sugar industry.

He was succeeded in the position of Under Secretary by the writer of this Annual Report on June 26 last.

An overall review of the Department's work in relation to the primary industries is contained in the sections of this report prepared by the Divisional Directors and myself. More detailed reports of the work of the various Branches follow this general review.

SEASONAL CONDITIONS.

Seasonal conditions in 1957-58 were far from satisfactory in many districts for much of the year and indeed drought prevailed over the greater part of the State until early 1958.

In most agricultural districts, rainfall was well below normal during the second half of 1957, but above-average falls were recorded for the first six months of 1958 and the mild temperatures prevailing during autumn and the early winter months were favourable to the growth of field crops and pastures. The year was also a rather difficult one climatically in some of the horticultural districts, particularly in areas in which the crops are produced without the aid of supplementary irrigation.

Seasonal conditions in dairying districts were unsatisfactory until they received good falls of rain in February, when the near State-wide drought was broken, except in western areas. The dairying districts participated in the good follow-up rains recorded in March and April, and although May was a dry month, very favourable conditions for the sowing of winter fodder crops were provided by further rains in these districts during June.

Until early 1958, adverse seasonal conditions prevailed in the beef cattle country, in which large areas of pasture were destroyed by bush fires and many stock routes closed. However, as in the case of the dairying districts, relief rains fell early in the year in many beef cattle areas, followed by reasonably well distributed falls which were generally adequate for pasture growth but not sufficient, in all cases, to replenish surface water supplies. Out-of-season cyclonic rains in June covered a large area in central and southern Queensland, including the Maranoa and parts of the Warrego, and, as a consequence, prospects for pastures and grazing crops in these districts were greatly enhanced at the end of the year. Unfortunately, the south-west and the far south-west did not participate to any appreciable extent in worthwhile rain and the serious position existing in those sections of the State, at the beginning of the year under review, deteriorated still further, particularly in the far south-west, in which the 1957-58 rainfall was less than half the annual average. Elsewhere in the west, many beef cattle districts experienced poor seasonal conditions, as they did not obtain relief in the same measure as did the coastal and subcoastal pastoral areas early in 1958, and, in some of them, near-drought conditions prevailed throughout the year.

The rainfall pattern in the sheep country was pretty much the same as elsewhere, showing an improvement in the first six months of 1958 as compared with the second half of 1957, although conditions still remained poor in some sections, particularly in the south-west. One feature of the rainfall in the sheep country was the very patchy nature of its distribution, some centres, on occasions, recording good falls while little or no rain fell on properties only a few miles distant from the recording centres.

EFFECTS OF THE DROUGHT.

Although the widespread drought of 1957-58 did not continue in most districts as long as some previous droughts, it caused serious losses in some of the State's most important primary industries and adversely affected others in varying degrees. The extent to which it reduced

production and, in certain cases, the quality of the produce in the industries affected receives some mention at a later stage in this report and is referred to, in greater detail, in Divisional and Branch reports.

So far as Departmental services are concerned, the drought conditions were responsible for an abnormally large number of requests for information and advice being received and dealt with by some Branches. They were also responsible for a serious setback to a number of experimental and demonstration projects, both on experiment stations and on private properties. By way of some measure of compensation, however, the season demonstrated the soundness of many of the standard Departmental recommendations and it provided opportunities for investigational work under prolonged adverse conditions. Such work can be productive of information which, although of no immediate value to the farmer or grazier seriously affected by the recent drought, may lead to the determination of ways and means whereby losses experienced by him may be materially reduced or, in certain instances, eliminated when drought once more holds sway in Queensland.

The impact of the drought was by no means confined to the losses sustained by primary producers and to the setback to experimental and demonstration work. It was soon evident throughout the community in general, for in 1958, perhaps more sharply and more quickly than on most previous occasions, it was apparent that drought losses cannot be absorbed wholly by primary producers. While no-one would view the incidence of drought as being other than a misfortune, the recent drop in production must surely have a salutary effect on the attitude of the community at large to the primary producer.

The handling and processing industries in particular were hard hit. Rail and road haulage of beef cattle, wheat and processed or partly processed primary products was greatly reduced. Flour mills, meatworks and other processing establishments in general worked below their capacity because of shortages in supply.

Inability to supply markets, particularly overseas markets that had been built up in the face of competition, meant an interruption of trading that could prove very harmful to some industries. Flour and barley are two products that were affected. In the case of barley, the Barley Marketing Board retained the crop for local sales to offset to some extent the shortage of wheat.

Supply houses to the various primary industries reported reduced sales of some commodities due to lower requirements and to the inability of many farmers to buy supplies of some requisites.

The community in general felt the effects of the drought also in higher prices for bread and other family foodstuffs. A drought loading on wheat and freight charges on imported grain meant increased prices for stock foods and these were reflected in prices for such consumer commodities as milk and eggs.

The repercussions of the drought have been shown in reduced Government revenues and all that these imply for the community.

The drought, however, did provide also some worthwhile lessons that will not go unheeded by the progressive farmer and grazier. One striking feature was the ability to hold stock on many properties that in past droughts had found it necessary to dispose of stock because of shortage of water.

Additional storage capacity for many millions of gallons of water for stock and irrigation has been provided on hundreds of properties in recent years. The extent to which such provision reduced the effects of drought on the properties concerned has been an object lesson to producers throughout the State.

The current interest in water-harvesting techniques indicates that many farmers are seeking a fairly simple means of conserving water on the farm.

Though some irrigated pastures failed during the drought, the value of irrigation on stock farms was so obvious that a substantial increase in the acreage of irrigated pasture may be expected. The ability of buffel grass in particular to stand up to dry conditions in some of the pastoral areas received much publicity that should result in widespread use of this grass.

There was abundant evidence throughout the drought of the value of conserving moisture in the soil before planting crops. This evidence came not only from Departmental experiment stations but from croplands throughout the agricultural areas.

Fodder conservation also demonstrated its potential value as an insurance against serious stock and production losses.

WHEAT AND OTHER GRAINS.

The 1957-58 wheat crop is estimated to have produced 6,500,000 bus. from a sowing of 600,000 acres. The acreage from which grain was harvested, however, was only two-thirds of that total, the balance of the sowing having been lost by drought or by being heavily fed off by livestock. The acreage harvested and the total crop were at the lowest level since the 1946-47 season. At the time of writing the prospects for a large crop are good, it being estimated that the wheat acreage sown is in the vicinity of 720,000 acres. Subsoil moisture reserves in general are regarded as adequate and there is justification for expecting that, in the current wheat season, there will be a return to a total yield meeting Queensland's own requirements and providing a reasonable surplus of the State's high-protein wheat for export, in addition to some overseas sales of flour. About 88 per cent. of this season's sowing of wheat is estimated as being on the Darling Downs, with substantial acreages in the Maranoa, South Burnett and Dawson-Callide districts and a very considerably increased sowing in the Central Highlands.

From Dec. 1, 1956, to Nov. 30, 1957 (i.e., during the cereal year), it was necessary to import 950,659 bus. from southern States to meet the local deficiency in wheat, the importation involving an additional *ex* store cost of 4s. 6d. per bus. The position is now considerably worse, as since Dec. 1 last 1,500,000 bus. have been imported and it appears that it will be necessary to bring in a further 600,000 bus. before the coming harvest to meet the State's

flour and stock feed requirements. The realisation of the current expectation of a good wheat harvest is thus of importance not only to the grain grower, but also to the housewife, to the user of feed wheat and indeed to the community in general.

Passing now to consideration of Departmental research work on wheat, it is noted that progress continues to be made with the plant breeding programme at the Hermitage Regional Experiment Station, rust resistance, frost resistance, high yielding capacity and flour quality being the main characteristics sought in new wheat varieties. One of these products of the plant breeder's skill gave the highest yield in varietal trials carried out on the open plains country of the Darling Downs and steps are being taken to have it increased, named and released as a new variety.

Departmental commitments in wheat research, however, are by no means confined to the production of new varieties, as is evidenced by reference to various wheat projects in the current reports of the Agriculture and Regional Experiment Stations Branches, the Plant Pathology Section of the Science Branch and the Chemical Laboratory. For example, the first-mentioned comments on nitrogen fertilizer experiments in a district which has consistently produced low-protein wheat on old cultivations in recent years and reports that useful additional information on the problem has been obtained during the year under review.

The general agronomy programme in wheat is carried out mainly on the Regional Experiment Stations, cereal chemistry is an expanding activity of the Cereal Section of the Chemical Laboratory, which also participates quite extensively in soil survey work associated with this crop, and other Branches of the Division of Plant Industry add their quotas to the Departmental wheat programme. The University of Queensland is also engaged in a programme of wheat industry research. However, still more comprehensive and intensive research work on the problems of this most important Australian primary industry is required and is now rendered financially practicable by the passing of the Wheat Tax Act 1957 and the Wheat Research Act 1957 by the Commonwealth Parliament. By the passing of these Acts, the wheat growers of Australia participate, with the Commonwealth Government, in the financing of the required expansion of the wheat research programme and are to be commended thereon. The Wheat Research Act provides for the establishment of a Wheat Industry Research Council and State Wheat Industry Research Committees, on both of which this Department is represented by myself. Increased funds now being available for work in Queensland, proposals for the acquisition, equipping and staffing of a new wheat research centre on the Darling Downs are receiving attention as a first step in the development of the research programme. The Department has the assurance that the establishment of such a centre is viewed with favour by the Commonwealth Minister for Primary Industry.

Although the yield of barley from the 1957 sowing of 160,000 acres was substantially below that of the previous season, being estimated at 2,500,000 bus. harvested from 130,000 acres, it was still well in advance of what used to be considered a normal level of production for this commodity. Much of the season's yield was used as feed grain. As in the case of wheat, prospects for a good harvest from an increased acreage are bright and indeed production may exceed the 1955-56 record level.

The maize crop was below average but not to the extent anticipated early in the season, the delayed onset of normal winter conditions largely offsetting the expected adverse effect on yield of the late planting in many areas. The estimated yield of 2,500,000 bus. fell short of last year's harvest by only 250,000 bus. Except on the Atherton Tableland, where climatic conditions require special consideration, hybrids have almost entirely replaced open-pollinated varieties in the main maize growing districts. The Departmental Seed Certification Scheme certified 10,000 bus. of hybrid maize seed required for the 1957 sowing.

As was the case with maize, the grain sorghum harvest was better than anticipated early in the season, the later planted crops yielding well under the mild autumn conditions. Production was estimated at 2,750,000 bus., i.e., about 14 per cent. below last year's yield. An interesting and potentially important development in Departmental work on this crop is a hybrid sorghum breeding project based on material introduced from the United States of America, in which country much success has been achieved in producing high-yielding hybrids.

The 1957-58 linseed harvest was approximately 12,000 tons. The yield per acre was seriously affected not only by drought conditions, but, in many cases, also by heavy insect infestation.

SUGAR.

This year's cane crop is estimated at 9,966,000 tons as against last season's harvest of 9,142,000 tons which yielded 1,264,500 tons of 94 n.t. sugar. It is thus evident that seasonal conditions in the sugar districts in general have been favourable to the growth of the crop.

International sugar quotas were suspended for most of 1957 and, as a consequence, Australia exported 767,832 tons of sugar during that year, this being 148,000 tons in excess of what would have been its quota had quotas been in operation. Quotas are again operating since the fall in sugar prices and this year's basic quota is 631,962 tons, which, however, may be increased if there are short-falls in other Commonwealth countries.

Under the Commonwealth Sugar Agreement, the negotiated price for sugar for 1958 was determined at £43 16s. 8d. sterling per ton, this figure representing an increase of £1 13s. 4d. sterling over last year's price. There has also been an extension of the Agreement for a further year until the end of 1965.

An overall price of £49 5s. per ton was received for home consumption, surplus and excess sugar in the 1957 season as against £46 10s. 6d. in 1956. There has been a decline in current export prices and the 1958 overall price may accordingly be at a lower level than last year.

The International Sugar Agreement is due to expire at the end of 1958 and the drafting of a new agreement was programmed for discussion, under the aegis of the United Nations, at Geneva during the month of September.

The bulk handling installation at Mackay is operating satisfactorily and it is anticipated that the installations at Lucinda Point and Bundaberg will also be in operation this season.

TOBACCO AND COTTON.

Tobacco and cotton are two crops the local production of which falls far short of Australian requirements, there thus being ample scope for an increase in both cases. Success in achieving the establishment of cotton growing on a really sound basis and the further expansion of tobacco production would add materially to the prosperity of the districts in which these crops are grown and would, at the same time, relieve pressure on overseas exchange payments. During the year under review, they fared very differently, tobacco, grown almost entirely with supplementary irrigation, showing a very definite upward trend, whereas cotton, produced largely as a rain-grown crop, was greatly handicapped by the adverse seasonal conditions.

The 1957-58 season's tobacco crop of 6,350,000 lb., harvested from approximately 7,800 acres, was a record for the State. The crop increased by more than 40 per cent. in total yield and just on 15 per cent. in acreage over the previous season. An average price of 137·23d. per lb. has been obtained from the first 4,635,000 lb. of leaf sold, compared with the final average price of 128·13d. per lb. for last season's crop.

That the campaign conducted during the last few years to ensure sound grading and attractive presentation of leaf offered for sale has borne fruit is evidenced by the improvement in the general standard of the leaf on the sale floors. Nevertheless, there is still room for improvement, and efforts to achieve the overall desired standard should not be relaxed.

During the year, negotiations took place between manufacturers and the Tobacco Leaf Marketing Board, without finality being reached, on certain aspects of the auction system of marketing and the problems associated therewith, these also receiving consideration by the Tobacco Advisory Committee.

The qualifying percentages for the rebate of import duty for 1959-60 have been fixed at 22 per cent. for cigarettes and 23½ per cent. for cut tobacco. These represent a substantial increase over the percentages finally determined for 1958-59.

An expanded programme of tobacco research has been made practicable by the development of facilities at the Millaroo Regional Experiment Station and at the Inglewood and Parada Tobacco Experiment Stations. Such expansion is fully justified by the increasing importance of this crop in the State's rural economy, and by the necessity for solving those problems of production with which tobacco growers are still faced.

The position with respect to the extent to which Queensland production fails to meet Australian requirements is much more unfavourable in cotton than in tobacco. In the 1956-57 season, 2,845 bales of lint were produced from 8,726 acres, and although approximately 17,000 acres were sown for the 1957-58 season, it is believed that because of adverse climatic conditions, the crop will yield about 2,800 bales, harvested from an estimated 9,000-10,000 acres. This is still only a very small contribution to the Australian spinners' requirements, which are estimated at being between 80,000 and 90,000 bales per annum. The report of the Marketing Branch comments on certain factors militating against the expansion of this crop.

Results obtained at the Regional Experiment Stations demonstrate that good yields of cotton can be obtained not only when grown with supplementary irrigation but also when produced as a rain-grown crop. It is accordingly hoped that the renewal of the Commonwealth guarantee of 14d. per lb. of seed cotton for a further five years from Jan. 1, 1959, will, combined with a return to more favourable seasonal conditions, lead to a level of production more in keeping with Australia's requirements.

FRUITS AND VEGETABLES.

The large summer harvest of good quality pineapples and the well developed state of fruit for the later crops, as observed at the time of writing, seem to justify the expectation that the 1958 production of pineapples will be somewhat in excess of the 1957 yield. Unfortunately, the export market for this commodity continues to be unsatisfactory, largely because of keen competition from Malaya and the Union of South Africa.

Apple production in the Stanthorpe district continues to expand and, in spite of the dry conditions under which this season's crop was produced, it is estimated that production will fall not far short of the record 810,000 bus. harvested in 1957. In view of this steady expansion, it is pleasing to note that excellent returns were obtained from 27,000 cases exported to the United Kingdom early in 1958. Two consignments shipped direct from Brisbane, instead of *via* Sydney, reached the United Kingdom market early in the season and realised the good prices then ruling.

The improvement in seasonal conditions during the early months of 1958 in coastal districts was expected to enhance the prospects of reasonably good quality in winter and spring bananas. However, the heavy rains experienced in June and the prevalence of leaf spot in southern districts may have constituted somewhat of a setback to these expectations. With respect to the leaf spot, there has been a noteworthy achievement in the very good results obtained from commercial-scale applications, in North Queensland banana plantations, of a spray formulation evolved as a result of field experimental work by the Plant Pathology Section of the Science Branch. This disease is one of the most serious adverse factors encountered in banana growing in the North, another being the banana thrips, the cause of rust in the fruit. Sound control measures are now available for both.

The citrus crop, except in the Near North Coast in which the yield is expected to be one

of the lightest on record, stood up reasonably well to the adverse seasonal conditions. Fruit-sucking moths, however, were more destructive in citrus orchards than they had been for many years, and their ravages largely cancelled out the benefits accruing from resistance to the adverse seasonal conditions. The sporadic, sudden nature of the outbreaks of these pests means that their investigation, with a view to devising satisfactory control measures, is difficult. However, the Entomology Section of the Science Branch has the matter in hand, and is planning an expanded research programme on fruit-sucking moths.

As in previous years, the Horticulture Branch was responsible for a research programme on a wide range of fruit and vegetable problems in which a considerable measure of success was achieved, e.g., the production of a rust-resistant bean and improvement in apple storage methods which have been used with success on a commercial scale. Much of the research work is conducted on the now well-developed Maroochy and Redlands Experiment Stations in the south and at the Ayr Regional Experiment Station and Kamerunga in the north as well as at the Brisbane laboratories.

A noteworthy addition to the research facilities available at Redlands is the 1,600 sq. ft. glasshouse for work in plant improvement projects. The Department is much indebted to the Vegetable Sectional Group Committee and the Other Fruits Sectional Group Committee of the Committee of Direction of Fruit Marketing for providing the finance for this facility.

The erection of the Food Preservation Laboratory at Hamilton is well under way. When in operation, it will provide good facilities for research work on the physical and chemical changes taking place in stored foodstuffs and on other aspects of food preservation, a sphere of investigation which should pay good dividends in this State.

THE DAIRY INDUSTRY.

The drought conditions prevailing in the dairying districts for the greater part of the year under review reduced the returns from butter and cheese production by approximately £5,000,000. They also caused losses of livestock which, at least in some cases, were very heavy. These losses in production and livestock occurred at a time when butter prices in the United Kingdom had declined disastrously, cheese prices on that market being on an unsatisfactory, but not so disastrously, low level. The Marketing Branch's report graphically depicts the extent of the fall in Australian butter prices in the United Kingdom since the long-term contract was terminated three years ago.

Dairy industry organisations have made a noteworthy move to meet the situation by drafting proposals designed to stimulate local consumption of dairy products, thus reducing the volume of butter and cheese available for export to the unprofitable United Kingdom market. Their proposals also include provision for the expansion of research into various industry problems, the whole programme to be financed by levies of $\frac{1}{8}$d. per lb. butter and $\frac{1}{16}$d. per lb. cheese, supplemented by a subsidy from the Commonwealth. The operation of such a scheme is dependent on enabling legislation being passed by the Commonwealth Government.

The legislation providing a guaranteed price for butter and cheese consumed within Australia plus exports up to 20 per cent. of local consumption was renewed by the Commonwealth for a further 5-year term as from July 1, 1957. The price paid to producers under this guarantee during 1958-59 will be 2d. per lb. higher than in the year under review.

Because of the prevailing drought conditions, the expected expansion of the group herd recording scheme, which is now in its tenth year, did not eventuate and the number of groups operating remained unchanged at 80 at the end of the year. Withdrawals of herds seriously affected the numerical strength of some of these groups but it is hoped and expected that, with a return to more favourable conditions, they will once more be built up to a reasonable level. It is worthy of note that production in many of the herds recorded remained unaffected, or only slightly so, by the adverse weather conditions.

During the year, just on 300,000 dairy cattle were tested for tuberculosis infection by veterinarians holding testing contracts, and, of the animals tested, 351 or 0·12 per cent. were found to be reactors. The number tested was considerably below last year's total, partly because biennial testing has been introduced in additional districts in which the eradication of the disease is making good progress and partly because of the undesirability of subjecting animals weakened by drought to the strain imposed by extra handling. A reduction in the number of veterinary practitioners participating in the eradication scheme also had an important bearing on the number of animals tested during 1957-58. It is hoped that this reduction will be of a temporary nature only.

Major animal industry investigations continued during the year included the dairy cattle infertility survey and the bull-proving project for the Jersey and A.I.S. breeds, the progress of which is discussed in considerable detail in the report of the Cattle Husbandry Branch.

An interesting project of the newly established Economics Research Branch of the Division of Marketing is an investigation of dairy cattle feeding costs. The work has been initiated in the Warwick and Beaudesert districts. In the former, it is designed to ascertain the relative profitability of the four major feed patterns on dairy farms on the southern Darling Downs. In the latter, where the project is being undertaken in co-operation with the Cattle Husbandry Branch, the objective is to determine the cost of feed and the returns obtained by a group of suppliers of wholemilk during the winter months, who are producing on the basis of intensive supplementary feeding.

As in past years, the Dairy Research Branch has covered a wide field of problems affecting the quality of dairy products, and has played an important part in the provision of quality control schemes.

The Commonwealth Dairying Industry Extension Grant has been renewed for a further period of five years as from July 1, 1958. This Grant is the source from which a considerable number of dairy industry projects, supplementary to those provided for entirely from Departmental funds, are financed either wholly or in part. All three production Divisions have been associated in varying degree with these supplementary projects, which have been productive of much benefit in the past. That being so, it is considered that the renewal of the Grant will be appreciated by the dairy industry in general as well as by this Department.

THE PASTORAL INDUSTRIES.

During the year under review, 705,657 bales of wool were sold for a return of approximately £57,400,000, these figures representing a decline of more than 90,000 bales and £25,000,000 respectively from the high levels of the previous year when the second-best return on record was obtained from the Queensland clip, the all-time record being £98,000,000 for the 1950-51 season. It is well to remember, however, that the 1956-57 wool selling season was rather abnormal because of the receipt of much overgrown wool early in the season, consequent upon delayed shearings, and by the receipt, late in the season, of wool shorn prematurely by graziers desirous of returning to their normal shearing times. The intake of wool during 1956-57 was thus greater than would have been the case had there been no interruption to normal shearing schedules and the actual decline in production during 1957-58 is therefore not really accurately represented by the decline in the 90,000 bales sold at auction.

The State's sheep population declined by 916,000 during the year to Mar. 31 last, but this does not represent the total numerical loss due to drought, for it is anticipated that lamb markings for 1957-58 will be well below the level of recent years.

Fleece measurement has been undertaken by the Wool Biology Laboratory of the Sheep and Wool Branch for the past six years and this service has again been well patronised by sheep breeders. The total number of samples handled by the laboratory on their behalf during 1957-58 showed only a slight reduction on the previous year's figure, a not unsatisfactory result in view of the prevailing adverse conditions.

The value of fleece measurement as an aid to the stud-master in the selection of superior animals, and, through these animals, to the flock-master is undoubted. An informative account of this system of measurement is given in the report of the Director of the Division of Animal Industry, which also discusses, in some detail, systems of measurement of animal production now being adopted in the beef cattle, dairy cattle, pig and poultry industries.

One of the sheep industry's most important problems in this State is the low average percentage of lambing. Even when really satisfactory seasonal conditions are being experienced, this poor level of fertility renders difficult the achievement of a desirable degree of culling, and when drought conditions prevail, an early return to an adequate rate of stocking, on the breaking of the drought, is still more difficult unless replacement stock is obtained by purchase. Hence the importance of the work at the Toorak Field Station, designed to test breeding performances in the nucleus flock and to select and develop strains capable of reproducing satisfactorily in the semi-arid environment characteristic of much of the sheep country of this State. This is a fairly long-range project, progress in which is recorded in the report of the Sheep and Wool Branch.

Beef cattle losses as a result of adverse seasonal conditions were very considerable, stock numbers being 170,000 fewer at Mar. 31 last than 12 months previously. Slaughterings of adult cattle at meatworks were about 890,000 in 1957-58, thus being about 90,000 fewer than in the previous year. There was also a decline in the number of cattle going to destinations outside the State.

Meat production in Australia during 1957 reached a very satisfactory new peak of 1,273,000 tons, thus providing a large exportable surplus. For the 1957-58 year, 271,394 tons of beef and veal were produced in this State, production being 13 per cent. lower than in the previous 12 months. The exportable surplus of beef is guaranteed an assured market by virtue of the 15-year Meat Agreement with the United Kingdom. The guaranteed prices for beef, fixed at 95 per cent. of the 1953-54 contract prices, operated until the end of September, 1958, but after that date a 5 per cent. reduction applies, as agreed on at the 1955 review of prices. Mutton prices remained at the 1954-55 level until Oct. 1, 1958.

Australian and United Kingdom authorities met recently for the purpose of reviewing the minimum prices to be paid for beef during the 3-year period from 1961 to 1964 and for mutton and lamb in the 1958-1961 period.

The export trade in live cattle to the Philippines continues to expand, approximately 15,000 head and 1,800 head having been shipped for slaughter and breeding respectively during the year under review. This valuable eastern outlet for livestock was supplemented by the shipping of close on 1,000 head to New Guinea for breeding and slaughter. The conditions of certification applying to the export of these animals necessitates a great deal of supervision, particularly in the case of the breeders. It commences with the approval of the properties from which they are selected and continues until they are loaded on the ships. The supervision is exercised by officers of the Veterinary Services Branch, acting on behalf of the Commonwealth Government.

Very little active pleuropneumonia was encountered during 1957-58, only one property was quarantined during the 12 months, quarantine restrictions were lifted from 11 properties and at June 30 last no Queensland property was under quarantine for this disease. Full-time extension work on pleuropneumonia was commenced in 1954 and during the year under review four experienced officers were engaged on it. It may fairly be claimed that this campaign has been productive of distinctly beneficial

results, of importance also to southern States in the added measure of protection afforded against the introduction of pleuropneumonia.

The Pathology Branch at the Animal Research Institute at Yeerongpilly again allocated a considerable proportion of the time available for research to work on tick fever and tick control. It was responsible for the immunisation of 294 stud cattle against tick fever at Yeerongpilly and for an additional 68 handled at the Animal Health Station at Oonoonba. Increasing numbers of stud cattle are being immunised at the latter centre, following on an arrangement between the Department and owners whereby animals for properties north and west of Townsville should, as far as practicable, be dealt with at Oonoonba.

The Biochemical Branch, also located at Yeerongpilly, participated in the Departmental programme of investigations into problems of the pastoral industries. It was associated with work on copper and phosphate metabolism in ruminants, with digestibility studies on conserved fodder, and with the evaluation of the chemical and physical characteristics and biological efficacy of various tickicides.

Finally, in this brief account of some of the more important features of work and production in the pastoral industries, mention must be made of the Animal Husbandry Research Branch, which was raised from Section status to Branch status during the year under review. The headquarters of the Branch are at the Animal Research Institute at Yeerongpilly and it has available for experimental work the rapidly developing facilities at the Animal Husbandry Research Farm at Rocklea. The Branch is engaged mainly on cattle experimental work but sheep are also included in its programme of investigations. The very important problems of drought feeding of cattle and sheep and of copper and phosphate deficiencies are featured in its nutrition research work, the progress of which is discussed in some detail in the Branch's first annual report, as is the work on the important bull proving project.

PIGS AND POULTRY.

There was a slight increase in the number of pigs slaughtered during the year, the total being approximately 450,000, but of these a smaller percentage was carried through to bacon weight, in all probability because of the high cost of feed. In spite of the high cost, prices realised for pig meats were, on an average, about 6½d. per lb. below last year's level.

Facilities for experimental work with pigs are available at the Regional Experiment Stations at Kairi, Biloela, and Hermitage, and the report of the Pig Section makes reference to such work during 1957-58. It discusses, in considerable detail, studies on the utilisation of molasses by pigs at Kairi and studies on the technique of four-weeks weaning at Biloela.

Good progress was made with the erection of the Pig Testing Station at Rocklea designed to provide excellent one-to-a-pen accommodation for assessing the extent to which a boar will transmit commercially important characteristics to his offspring. These include economy in food conversion, speed of growth and uniformity in carcase quality. The service provided by this Station, which, it is hoped, will be operating at an early date, should enable pig breeders to improve the quality of their stock and to achieve an appreciable saving in production costs. The procedure adopted in pig testing is interestingly discussed in the report by the Director of the Division of Animal Industry.

Egg production declined considerably during 1957-58 and receivals by the South Queensland Egg Marketing Board were approximately 1,000,000 doz. less than in the previous year. As a consequence, the proportion of receivals to be disposed of on the less remunerative overseas market also declined and the Board, which handles the great bulk of the State's egg production, was able to pay growers an average net price of approximately 3s. 7d. per doz., which is about 5d. per doz. higher than last year's payment. As against this increased return, it is estimated by the Marketing Branch that, taken over the full 12 months, feed costs were more than 4d. per doz. above the average ruling in 1957-58. The increase in local price paid has thus largely provided for the higher cost of feed, but in spite of this there has been a decline in the number of poultry farmers registered with the Board as at June 30 last.

The Central Queensland Egg Marketing Board's intake of eggs increased during the year in spite of the higher feeding costs. Production in North Queensland remained about the same level as in the previous year.

The Poultry Section now has available, or in sight, a well designed group of buildings at the Animal Husbandry Research Farm at Rocklea in which to carry out a programme of investigational work on a reasonably adequate scale. That these facilities are being fully utilised will be evident on a perusal of the Section's report, which discusses the random sampling testing of breeding flocks conducted in conjunction with the Queensland Poultry Improvement Plan and the results of a number of investigations on nutritional and management problems. Although facilities for poultry work at the Kairi Regional Experiment Station are not comparable with those provided at Rocklea, it will be noted from the Section's report that these too are enabling the staff to engage in worthwhile investigations on nutritional problems.

PASTURES.

Earlier in this report, the seasonal conditions in the dairying and pastoral districts were discussed, as were the volume and value of butter, cheese, meat and wool production during the year under review. Some of the more important Departmental investigational projects in the dairy and pastoral industries also received consideration, but some reference must now be made to Departmental work on the pastures, not so far referred to, on which these industries are almost entirely dependent for their very existence, let alone their measure of prosperity.

That pasture investigational and demonstration work is receiving a large measure of attention in the Departmental programme is evidenced by a perusal of various Branch reports. From these, it will be noted that pasture investigational projects are featured at all the Regional Experiment Stations as well as at the

Bureau of Tropical Agriculture at South Johnstone and Utchee Creek. "Brian Pastures" Pasture Research Station, as its name implies, is devoted specifically to pasture research, with the beef cattle located on it playing a necessary, but subsidiary, part in the evaluation of the pastures and their management. Apart from the great amount of pasture work under way at these permanent experimental centres, the Agriculture Branch was responsible, during 1957-58, for 133 pasture experiment plots established throughout the State on the properties of farmers and graziers who had agreed to co-operate in this most important work. That Branch was responsible also for 33 pasture demonstrations, again in co-operation with property owners, established under the Commonwealth Extension Services Grant, while the Field Services Branch of the Division of Dairying handled 108 pasture demonstrations, on a similar co-operative basis, but in this case under the Commonwealth Dairy Industry Extension Grant.

As the Director of the Division of Plant Industry pertinently comments in his report, the 1957-58 year provided a contrasting range of seasonal conditions well suited to testing the merits of native and introduced pasture species. The reports of the Agriculture and Regional Experiment Station Branches may thus be read with particular interest in this connection.

Buffel grass, green panic and lucerne again demonstrated their capacity to withstand long dry periods and to make rapid regrowth when seasonal conditions improve. Biloela buffel grass was outstanding in this respect at the Biloela Regional Experiment Station. In view of the promise buffel grass holds for increasing the carrying capacity of much of the sheep and beef cattle country in the west, the development of simple machines for harvesting seed of this grass is worthy of record. Departmental work on buffel grass commenced during 1957-58 included an experiment in the Cloncurry district designed to test the ability of this introduced species to spread at a satisfactory rate into native grassland when it, the introduced species, is sown in strips 2 yards wide and 20 yards apart. Ability to so spread from such sowings combined with an appreciable reduction in the cost of seed obtained by machine harvesting should greatly facilitate the establishment of buffel grass in lightly stocked pastoral areas.

The investigation of the factors responsible for the poor results obtained in attempts to establish sown pastures on the heavy self-mulching soils on the Darling Downs is now under way. Initial work on the establishment of sown summer pastures on poor sandy soil in the Burnett has met with some measure of success.

The testing of newly introduced grasses and legumes, of which three hundred were received during 1957-58, was continued under quarantine conditions, principally at the Regional Experiment Stations. While it is hoped that from such introductions there may be obtained new species or varieties worthy of being included as valuable components in some Queensland pastures, the possibility of achieving improvement in native species is not being overlooked. In this connection, mention may be made of the work being undertaken on Queensland blue grass. This is a very variable native species and in it four strains of apparently outstanding merit have been selected and are now being tested under differing soil and climatic conditions.

Reference may here be made quite appropriately to the report of the Botany Section of the Science Branch in which the most effective manner of handling mulga as a drought fodder for sheep and cattle is discussed.

STAFF.

Coincident with the appointment of the writer as Under Secretary, Mr. W. Webster, who had been Director of the Division of Animal Industry since 1947, was appointed Assistant Under Secretary (Technical).

Two changes in organisational structure, involving the establishment of an Economics Research Branch within the Division of Marketing and the recognition of the Animal Husbandry Research Section of the Division of Animal Industry as a Branch, resulted in the appointment of Mr. C. H. P. Defries as Director of Economic Services and in the recognition of Mr. J. W. Ryley as head of a Branch rather than a Section.

The pattern of staff changes that has been evident for years past was repeated in 1957-58. Foreseeable losses such as age retirements and normal staff turnover have been met mainly from within the Department, but resignations of specially qualified and experienced officers beyond the normal expectancy continued to cause concern. The gaps left by such losses are not easily filled, as specialisation is involved, and fully experienced replacements are not readily available. Thus, while graduate staff recruitment may in terms of numbers counterbalance the losses of scientific officers, such recruitment cannot cancel the loss of experience and special qualifications. Further, the training of new men throws an added burden of supervisory duties on to the remaining senior personnel.

On the extension side there is an insistent need to provide capable men for the advisory services, and the policy of recruiting diplomates of agricultural colleges for training in extension and technical duties has been continued with considerable success.

Higher salaries and better prospects of advancement appear to be the main attractions for professional officers leaving the Department. One of the difficulties in retaining professional staff of intermediate grade in some fields has been that the organisational structure did not provide sufficiently good prospects of advancement to higher grades. This position is being corrected as opportunity offers. During the past year the position of the Chemical Laboratory of the Division of Plant Industry was improved in this respect. The re-organisation effected in research services in the Division of Animal Industry will also prove useful in the recruitment and retention of staff.

Recruitments to all Divisions were made during the year, but many vacant positions remained unfilled throughout the whole 12 months.

None of the year's graduates in Agricultural Science at the University of Queensland who were not Departmental scholarship holders entered the Department's service, and only one such graduate in Veterinary Science was appointed to the permanent staff. Scholarship holders who completed their courses at the end of the 1957 academic year and took up positions in the Department numbered 2 in Plant Industry and 4 in Animal Industry. Six cadets graduated in Science.

University scholarships for the 1958 academic year were awarded as follows:—Agricultural Science, 6 (including one financed by the Queensland Dairymen's Organisation); Veterinary Science, 7 (including two financed from the Wool Fund); Science, 5 (including one financed from the Commonwealth Extension Services Grant); and Economics, 2.

Female graduates in the sciences are employed in various professional positions in the Department. Early in 1958, the Industrial Court of Queensland included a scale for females in professional positions based on the margin over the basic wage paid to males doing the same work.

Among officers who ceased service with the Department during the year were several who had been on the staff for many years. Mr. E. R. Ashburn had served in the agricultural advisory service since 1923; Mr. R. W. Peters had been engaged in plant improvement since 1923; and Mr. F. Keogh had been employed in Departmental chemical laboratories for over 40 years.

In addition to the Under Secretary (Mr. A. F. Bell), two officers with long and meritorious service died during the year. They were Messrs. S. C. Todd (Senior Inspector under the Fruit and Vegetables Acts) and E. W. Baird (Senior Adviser in Agriculture).

We were indeed fortunate that we were able to obtain the services of Mr. Robert Veitch who had retired from the position of Asst. Under Secretary (Technical) in December, 1956. Mr. Veitch returned on a part-time basis to assist in the inevitably difficult situation caused by the unexpected and untimely loss of Mr. Bell.

OVERSEAS VISITS.

Special leave of absence was granted to several officers to enable them to undertake University and other studies overseas.

Mr. J. R. M. Wolfe (Extension Methods Section) completed a course in extension education leading to the degree of Master of Science at Cornell University. He was assisted financially from the Commonwealth Extension Services Grant.

Mr. R. C. Menary (Horticulture Branch) obtained a Rotary Fellowship to the University of California, where he did work in plant physiology for a Master of Science degree.

Mr. A. W. S. May (Entomology Section) left in June to visit Hawaii and mainland States of the United States of America in connection with fruit fly investigations. His visit is being sponsored by the Australian Agricultural Council.

Mr. R. C. Colbran (Entomology Section) secured a Rockefeller Foundation Fellowship at the University of California and is undertaking a year's study in entomology at that centre.

Mr. B. J. Crack (Chemical Laboratory) was awarded a King George VI. Memorial Fellowship tenable in soil chemistry at the University of California.

The visits to North America of Messrs. C. H. P. Defries (then Assistant Director of Marketing) and W. J. S. Sloan (Director of Agriculture) during 1957 resulted in much useful information being obtained. Dr. B. R. Champ, of the Entomology Section, who had been studying in the United Kingdom and on the Continent for 2½ years, returned to duty in April, 1958. While overseas he obtained the degree of Ph.D. at Cambridge University for studies on insecticides.

ACKNOWLEDGEMENTS.

As in previous years, the Department received much appreciated co-operation from many producers' organisations, individual primary producers and from firms associated with the farming and grazing industries. Thanks are due also to the press and to broadcasting stations for their co-operation throughout the year. Finally, appreciation is expressed of the sympathetic and helpful response of both Commonwealth and State Departments to requests submitted to them by this Department.

W. A. T. SUMMERVILLE,

Under Secretary.

Oct. 3, 1958.

DIVISIONAL DIRECTORS' REPORTS.

DIVISION OF PLANT INDUSTRY.

Director: Mr. W. G. Wells.

The year under review was a difficult one for the Division of Plant Industry and the primary industries it services. Below-average rainfall, approximating severe drought conditions in central and southern Queensland during the second half of 1957, caused shortages of feed grains, pasturage and waters of suitable quality for either livestock or irrigation purposes. Requests for information and assistance reached near-record proportions until widespread rainfall early in 1958 relieved the situation in most farming districts and all but the far western pastoral areas. Exceptionally favourable growing conditions for the rest of the season promoted satisfactory yields of most summer crops.

The season has not been without indirect value in that it provided excellent opportunities to demonstrate the validity of many standard recommendations of the Division. Likewise it afforded opportunities to conduct investigations under prolonged stress conditions, thus providing technical data of utmost value. These findings may be of little immediate interest to the primary producer who experienced severe losses due to the drought, but many of them will be used in developing ways and means to eliminate a repetition of such losses.

Much can undoubtedly be achieved in this direction by using tested information already available. Basically, the solution of many of the plant industry problems of this State involves a full appreciation that, according to the fertility of the soil, each crop has its own water requirements to produce any given amount of grain or fodder. Further, the water requirements of many plants must be available at critical stages in their growth if satisfactory yields are to be obtained.

Work at Regional Experiment Stations embraces studies of the water and nutrient requirements of crops and evolving rotations to provide favourable conditions to meet most of these needs. Each year's studies provide added evidence that satisfactory yields of pastures and crops can be more regularly obtained from rotations based on correct land use than where either permanent pastures are established or some form of crop monoculture is practised. The rotations must be designed, however, to ensure most of the water requirements of each crop being stored in the ground at its time of planting. Thus, at Hermitage, by correct land use (in this case the growing of row-cultivated lucerne on a deep soil) grazing was provided throughout the drought at the rate of six sheep per acre. This rain-grown lucerne was established four years ago and in the past season its water requirements were provided from pre-drought rains which had wet the soil to a depth of 16 feet.

Inclusion of pastures in rotation with crops will require animals to utilise the pastures. The mounting evidence being obtained experimentally and on commercial farms indicates that systems of balanced farming embracing pastures, crops and animals will materially help in evolving types of agriculture to enable the primary producer to live satisfactorily with his climate.

ROTATIONS.

A suitable rotation increases the chances of storing most of the water requirements of each crop embraced in it, and also improves the structure and fertility of the soil. In the 1957 season at Hermitage Regional Experiment Station the best yields of wheat (37·5 bus. per acre) on deep fertile soils were obtained from areas with the greatest amount of water stored in the ground at planting, rainfall during the growing period being only 3½ in. However, on a shallow hillside soil 28 bus. per acre were obtained in the fourth year of cropping after five years of lucerne. The use of lucerne in the cropping programme favours not only satisfactory yields of wheat but also grain of high protein content.

Likewise at Kairi Regional Experiment Station over a series of years rotations embracing four years of a mixed lucerne-Rhodes grass pasture and five years of annual cropping have consistently produced higher yields of maize in comparison with only repeated cropping to maize.

FODDER CROPS.

Although the use of systems of balanced farming will materially reduce the present irregularity of crop and pasture yields, prudence dictates that fodder and grain reserves should be stored to guard against disasters of one form or another. Accordingly, Divisional officers have continued to investigate the merits of various fodders for storage as silage and methods of storing them. Interesting findings from the trials conducted at Kairi and Biloela Stations were that the modern type of row forage harvester could harvest satisfactorily either row-cultivated maize or Sugardrip sweet sorghum grown in combination with velvet beans, and that higher yields of silage of greater protein content were obtained from either mixture than from the fodder crops grown alone.

Performance testing of cowcanes and improved strains of elephant grass confirmed the availability of suitable strains of these types of fodder for even the dry conditions of the past season. Undoubtedly use of them as both grazing and standing fodder crops would greatly increase the carrying capacity of many farms.

The season provided opportune conditions to study methods of using mulga trees for stock feeding. The Government Botanist's report on a reinspection of the areas he studied in the 1944-46 drought indicates that, following proper cutting and grazing managements, regrowth was again available to supply fodder. In fact, he has expressed the opinion that, if properly handled, areas of mulga will provide good drought insurance for sheep for an indefinite period.

GRAIN CROPS.

Although the climatic conditions reduced the wheat crop to a total yield of approximately 6½ million bushels, the winning entry in the State-wide field wheat competition of the Royal Agricultural Society (Toowoomba) produced an average of 47 bus. of grain with a 14·1 per cent. protein content. The protein percentage was a reflection of the dry season, and the high yield showed that a crop correctly grown on soil of high moisture-holding capacity in a rotation embracing regular use of lucerne has a decided advantage in dry seasons.

In wheat breeding work varietal and strain trials again demonstrated the merits of the Lawrence x Gabo progenies bred by the plant breeders. One of these progenies is being multiplied for release and general testing.

The early-planted maize crops averaged poor yields, and although much of the later plantings produced normal crops, the State total yield was below average. Maize hybrids have practically replaced open-pollinated varieties in all of the main maize districts except the Atherton Tableland, where the wet conditions require a special type. In the Burdekin Valley, under conditions of ample moisture and nutrients, the leading hybrids have regularly yielded over 100 bus. per acre.

The value of producing several types of grain crops within this State was well shown in 1957-58. As a result of the reduced 1957 wheat crop and below-normal plantings of maize in 1957-58, the feed grain supply position depended largely on grain sorghum production. The October-November plantings of grain sorghum, as a whole, produced poor to near-failure crops due to the lack of sufficient subsoil moisture at planting time. However, good yields were obtained from those sowings on long fallow—i.e., 12 months or more—evidencing the high correlation between yield and amount of available water stored in the soil at planting time. Later planted crops experienced better rainfall and, except where damaged by severe midge attacks, yielded well under the combination of above-normal autumn average temperatures and freedom from early frosts. Consequently grain sorghum crops relieved the serious shortage of feed grain resulting from the reduced production of wheat and maize crops.

PASTURES.

The combination of drought in the last half of 1957 and favourable conditions over most of the State in the first half of 1958 provided a very suitable range of conditions for testing the relative merits of both native and improved types of pastures. As a result, the pasture position in many districts has been appreciably clarified. It is now apparent that several introduced pasture species which have been under investigation for some years can regularly yield superior performances to many of the native pastures if correctly selected for the conditions involved. However, native species still provide the only pasturage available over vast areas and their most efficient utilisation still presents many problems, aspects of which are being studied at "Brian Pastures" Pasture Research Station and at other appropriate centres.

The search for superior pasture species was continued by the introduction of 300 grasses and legumes which were distributed to experiment stations and district officers for regional testing under quarantine conditions. Genetical studies of a number of strains of Queensland blue grass (*Dichanthium sericeum*) reached the stage where four strains will undergo district testings.

There are now 133 experimental pasture plots located throughout the State under the control of the Agriculture Branch in addition to 33 demonstrations conducted under the Commonwealth Extension Services Grant. Divisional officers also act as consultants in 77 rain-grown and 28 irrigated pasture demonstrations operated by the Division of Dairying under the Commonwealth Dairy Industry Extension Grant. Likewise, the Regional Experiment Stations Branch, in co-operation with the Division of Animal Industry, carries out a wide range of investigations of both dryland and irrigated pastures under grazing conditions. The reports of the Agriculture and Regional Experiment Stations Branches present in detail the interesting results being obtained in the pasture investigations conducted by these Branches.

An outstanding feature of the results on cultivated dryland areas under very dry conditions has been the performance of lucerne planted either in combination with introduced pasture grasses or in row-cultivated pure stands. Undoubtedly greater use of this deep-rooting legume is badly required under both dryland and irrigation conditions on many farms in the 22–35 in. rainfall belt in southern and central Queensland and in suitable parts of North Queensland.

The very dry conditions stimulated further interest in irrigated pastures. Some 400 acres were established in the Burnett districts and expansion was also effected in the Beaudesert, Brisbane Valley, Callide Valley and several coastal districts. A feature of this work was the development of bores and farm dams to provide independent water supplies. The incorporation of farm dams in water harvesting schemes will be greatly assisted by legislation enacted during the year. Investigations at Biloela and Gatton Regional Experiment Stations on water usage and crop response are contributing valuable information which will assist in the development of correct use of such water supplies.

Plate 1.—New Glasshouse at Redlands Experiment Station.

Plate 2.—Office and Laboratory of the Artificial Breeding Centre, Kairi Regional Experiment Station.

Plate 3.—Office and Laboratory Block at Ayr Regional Experiment Station.

Plate 4.—Growth in Mid-February (mainly Cocksfoot and Irrigation White Clover) of Temperate Pasture Mixture under Irrigation at Gatton Regional Experiment Station.

SOIL CONSERVATION.

The increased realisation by farmers of the need for conserving their soil was evidenced during the year by the requests of 1,270 farmers for soil conservation services. This compares with a total of 1,668 farmers who are already applying conservation measures. The advisory staff visited over 1,000 of the farms involved and provided plans for the measures necessary to control surplus run-off waters.

The drought was broken by severe thunderstorms. Such testing conditions demonstrated that on cultivated sloping land mechanical measures are required to support approved agronomic practices. Due to the lack of planting rains much land was in fallow when the storms occurred with intensities up to 6 in. per hour for periods of 15–20 min. Much loss of soil resulted—in some fields all loose soil to plough depth. It is evident, however, that there is a slow but continuing trend towards improved land use practices.

TOBACCO.

The area under tobacco increased in 1957 to approximately 7,800 acres, a rise of 1,000 acres over the previous crop.

An expanded programme of investigations at Inglewood and Parada Tobacco Experiment Stations and Millaroo Regional Experiment Station should greatly increase knowledge of growing irrigated tobacco. At Millaroo a series of short and long course rotations is continuing, to study the merits of various systems of croppings.

PEANUTS.

Although the main planting was somewhat late, approximately 30,000 acres of peanuts were sown. Mechanisation of the industry continued, particularly in the South Burnett, where there was an increase in the practice of sun-drying the harvested plants in windrows followed by pick-up threshing. Eight drying units were in use on the Atherton Tableland, where the Division co-operated with the Commonwealth Department of Primary Industry and the Peanut Marketing Board in investigating the factors involved in artificial drying of peanuts without loss of quality or viability.

COTTON.

The dry conditions prevailing for the first nine months of 1957 in most of the cotton growing districts severely reduced both the acreage and the average yield of cotton. Investigations at Biloela Regional Experiment Station demonstrated once again the need for a good supply of subsoil moisture at planting time and that yields in the first year after grassland substantially exceeded yields from second- and third-year cultivation, thus confirming many previous findings at this centre.

The value of supplementary irrigation in growing cotton, especially in a dry year, was well demonstrated at this experiment station, where yields up to 1,731 lb. seed cotton per acre were obtained in the first picking with prospects of a light second picking after June. The best rain-grown yields approximated 880 lb. seed cotton per acre. Yields up to 1,477 and 1,427 lb. of seed cotton per acre were produced in irrigated cotton at Ayr and Millaroo Regional Experiment Stations respectively. Results at all three experiment stations indicated that side-dressings of sulphate of ammonia substantially increased yields of irrigated cotton on old cultivations.

It is clear that the yields produced by most commercial growers can be increased. The granting by the Commonwealth Government of a 5-year extension of a guaranteed average net price of 14d. per lb. of seed cotton, as from January 1, 1959, has therefore given an opportunity to establish the cotton growing industry on a sound basis that will ensure permanency.

FRUIT CROPS.

Horticultural crops are produced under such diverse climatic conditions in this State that few generalisations can be made regarding the overall effects of the season experienced. Broadly speaking, however, non-irrigated areas were the worst affected in both fruit and vegetable crops except pineapples, which yielded a good harvest of excellent quality. As with agricultural crops, the season provided suitable conditions for clarifying many aspects of the investigations being conducted in horticultural crops. Some of the findings are as follows.

Trials in the Palmwoods, Gympie and Bundaberg districts confirmed previous conclusions that the usual fertilizer schedules for pineapples did not supply sufficient potassium on many types of soil. Fertilizer recommendations have therefore been amended in keeping with these findings.

As a corollary to studies in improving soil fertility, methods of conserving the soil have been investigated. Results have demonstrated that soil loss during heavy rains is reduced on all but the steepest slopes when storm-water drains have been installed between every third pairs of rows instead of between adjacent paired rows as is customary.

Investigations at Maroochy Experiment Station have markedly increased knowledge concerning the effect of types of planting material on uniformity of stand, yields and control of times of bunching of bananas. Bit planting material is superior to suckers, and it appears that by using from plants of the same age bit material which has been carefully selected for uniformity of weight and eye development, a marked improvement in uniformity of development of the plant crop will be obtained.

As in bananas, one of the main handicaps confronting the Division in the conduct of investigations in papaws has been the lack of planting material which produces sufficiently uniform plant and fruit performances. This difficulty has been overcome by the development of Hybrid No. 5, and the programme of investigations at Redlands Experiment Station has therefore been accelerated.

Investigations in citrus placed emphasis on endeavouring to discover new varieties to meet special requirements. Thus, in mandarins, new varieties are needed which will extend the cropping season. Facilities have been provided at Gatton Regional Experiment Station for testing a series of mandarin hybrids. Similar testing of introduced and locally selected varieties and strains of both mandarins and oranges is also being conducted at Maroochy Experiment Station and other district centres.

Increasing market demands for avocadoes have resulted in the planting of so many seedling types that it has become necessary to determine suitable marketing standards. Satisfactory progress in this direction was achieved in the past season, but elimination of many seedling types is highly desirable, and nurserymen are now adopting the propagation techniques developed at Redlands Experiment Station. In this connection the stock-scion investigations at that station continue to show promise, and within a few years it should be possible to place the industry on a sounder basis through the use of trees of standard specifications.

With the growing importance of apple production in the Stanthorpe district, the Division has given considerable attention to the growing and marketing of this fruit. In the production sphere, responses were again obtained from higher levels of potassium than used normally in commercial fertilizers. As a result, mixed fertilizers of high potassium content are now being used more generally than in the past.

Progress was also achieved in the chemical thinning of apples by the application of ANA. Promising results were also obtained in chemically hastening the maturation of apples through the use of 2,4,5-TP. If confirmed this method should allow earlier despatch to the profitable overseas markets normally prevailing in the early part of the year.

VEGETABLE CROPS.

With the increasing use of supplementary irrigation in tomato production a re-examination of fertilizer requirements of this crop was conducted. Results were obtained which appeared to indicate that, in assessing the merits of applications of fertilizers for tomatoes, movement of soluble nutrients through the soil profile, as well as varied utilisation at different stages of the plant growth, has to be considered. To overcome this problem commercial growers apply luxury amounts of basal fertilizers and heavy side-dressings when plant appearance and growth rates dictate. With high-yielding irrigated crops these may be satisfactory procedures, but under other conditions the economics of such practices require further examination.

Studies arising from the need for a rust-resistant variety of French bean in certain districts came to fruition by the release of Redlands Belle and Redlands Beauty for commercial trials. There is an increasing demand for stringless beans, however, both for processing and for domestic requirements. Unfortunately, available commercial varieties of this type do not perform satisfactorily in Queensland. A breeding programme to evolve suitable types has been conducted long enough to yield strains showing sufficient promise to warrant anticipation that a high class stringless variety will eventually be produced for Queensland conditions.

The programmes of investigations associated with cabbages, carrots, lettuce and similar crops have mostly embraced experiments dealing with fertilizers, plant spacings and varietal trials. The promising results obtained, if confirmed in subsequent experiments, would supply growers with means of improving their returns from such crops.

MARKETING HORTICULTURAL PRODUCE.

An important feature in the production of fruit and vegetable crops is the necessity for them to reach the consumer in the form of high quality products. This involves much more than the grower knowing how to produce the product and when and how to harvest and pack it. It also requires that the best methods of marketing it must be determined, and this in turn often involves solving transport, processing and storage problems.

This phase of the operations of the Horticulture Branch is steadily increasing in both importance and volume. In fact, the stage where greatly increased facilities are required for investigating the various problems encountered was reached some time ago. Accordingly, the construction of a Food Preservation Laboratory was commenced in February. When completed, it will provide a range of well-equipped laboratories which will greatly facilitate the conduct of many required important investigations.

The report of the Horticulture Branch describes the general nature of the investigations related to production, storage, processing, refrigerated transport and packaging of many horticultural crops.

AGRICULTURAL CHEMISTRY.

The report of the Chemical Laboratory indicates the assistance requested from the Laboratory by both primary producers and Departmental staff under the adverse seasonal conditions experienced during the year. Requests for analyses of water intended for

either irrigation or stock water totalled 810 during the November-January period alone. Shortage of protein-rich supplements resulted in requests for analyses of possible grain substitutes and advice on their use: some 467 samples of stock foods were examined. Likewise the expanding programme of pasture investigations being conducted by the Division required a total of 580 analyses of grasses and legumes.

The Division's expanding programme of wheat quality investigations resulted in considerably increased calls on the Cereal Section for protein, moisture and bushel weight determinations and full-scale quality testing.

Continuation of detailed soil surveys in the Mareeba-Dimbulah Irrigation Project enabled the Plant Nutrition Section to complete surveys embracing some 18,000 acres, and to make reconnaissance soil surveys of some 649,000 acres in three other districts. The survey results are used by the Irrigation and Water Supply Commission in investigations of the possibilities of irrigation development in these areas.

Investigations at Coolum Field Station were conducted under a range of testing conditions varying from a 33-year record low total rainfall of 35 in. in 1957 to a month's total of 24·36 in. in April, 1958. Promising results were obtained with several grasses in preliminary grazing trials and these trials will be expanded. Additional surveys of some of the swamp soils indicated that, if suitably drained and fertilized, these soils have a satisfactory yield potential. Investigations of their correct utilisation now under way will markedly increase the importance of the work at this centre.

PLANT PATHOLOGY INVESTIGATIONS.

The importance of disease control in Queensland agricultural and horticultural crops is apparent in the report of the Plant Pathology Section on the range of problems being investigated.

Modern agriculture presents an ever-changing series of problems that seldom can be serviced by any single science. Accordingly, all agronomic aspects are examined when control of a disease in a crop is desired. Thus, in investigating the incidence of leaf blast and head blight, which has been very severe in the popular Dwarf Panicum variety in recent years, an endeavour was made to obtain a more resistant variety. In trials conjointly conducted by the Pathology Section and the Agriculture Branch, Korean millet and Nunbank Setaria proved to be immune to the disease, although Dwarf Panicum was completely susceptible.

Conversely, where other methods of disease control are required, determination of correct application of appropriate sprays is investigated, this often involving experiments extending over several years. The findings of such a programme dealing with leaf spot of bananas in North Queensland were tested in the past season by commercial growers, who obtained spectacular control of this very serious disease.

ENTOMOLOGY SECTION.

The report of the Entomology Section stresses the effect of the drought conditions on insect control. Pest populations were generally large and infestations lasted over longer periods than are usually experienced. In some crops normal protection could not be obtained even with increased applications of insecticides. Thus the farmer was often faced with difficulties in saving already potentially low yields of non-irrigated crops from further reduction by insect attacks. In some horticultural districts, failure to apply normal spray programmes under the prevailing dry conditions resulted in marked occurrence of large populations of different pests. Similar results were experienced in some vegetable crops in coastal districts where the control programmes were not implemented in detail.

The exceptional seasonal conditions thus provided a severe testing of entomological recommendations. As with agricultural crops and practices, where satisfactory results were obtained the recommendations involved can be used with confidence. In general, however, evidence was obtained which confirmed the need for repeating investigations over several seasons to ensure obtaining a satisfactory sampling of the range of conditions likely to be experienced.

BOTANY.

The report of the Botany Section indicates the need for repeated surveys of the distribution of weed pests. In some instances under the dry conditions infestations of long standing were newly located; new introductions were also found, while other well-established pests proved to be spreading steadily into important districts. A feature of the season was the unusual incidence of suspected plant poisoning, possibly as a result of the lateness of the main grass-growing rains.

As with the mulga investigations, the season allowed valuable information to be obtained in a survey of the brigalow treatment programme. Climatic conditions appear to be a very important factor in brigalow control. A comprehensive survey will therefore be conducted in the coming season to obtain further information preparatory to implementing an expanded programme to elucidate the results already observed.

Several explorations were conducted in the interests of systematic botany which have materially increased the knowledge of the vegetation of this State, one in North Queensland in company with an overseas botanist being of particular value.

Construction of a fire-proof annexe to house the main reference library and the plant type specimens was almost completed.

STAFF.

The calibre of the solid core of research staff is worthy of praise and many aspects of the Department's work in agricultural science are rightly held in esteem.

The extension and inspectorial staffs have applied themselves assiduously to their field duties. Much effective work has been done by way of press, radio, meetings, field days, farm visits and other extension means.

In the fields of research and extension, the reciprocal advantages of personal exchange of technical information have previously been well demonstrated, and during the year the Division played important roles at liaison-study groups, schools and interstate conferences concerned with soil science, cereal chemistry, plant breeding, food processing, plant quarantine, fauna conservation, tobacco production and processing, agrostology, extension methods, and regional agronomy.

INDUSTRY ASSISTANCE.

It is pleasing to report an increased tendency of grower organisations to sponsor moves for their members as a whole to adopt tested and recommended production practices. With this awareness has also come a recognition of the degree to which representatives of the organisations, on a grower-to-grower or group-to-grower basis, can operate effectively among their fellow members in support of and in liaison with the district extension officers.

Guidance along those lines is already being provided by the Division as this is a form of industry assistance by which, with correct handling and proper acceptance of defined aims, much can be rapidly achieved in the introduction of more economic methods to individual farms, the interchange of information on a locality group basis, and the examination of problems on a district scale.

It is also desired to acknowledge with appreciation the financial assistance provided by industry organisations.

Among these were the contributions towards research on fruits and vegetables made by the various Sectional Groups of the Committee of Direction of Fruit Marketing, the further assistance by the Australian Dairy Produce Board, the Australian Meat Board, and Shell Chemical (Aust.) Pty. Ltd. for the demonstration and development of pastures for dairy stock and beef cattle, and the continued support of the Tobacco Growers' Associations for expansion of research on production and handling of tobacco leaf and in the financing of scholarships in Agricultural Science. Funds for an additional scholarship were again provided by the Queensland Dairymen's Organisation.

DIVISION OF ANIMAL INDUSTRY.

Director: Mr. W. Webster.*

During the first half of the year under review all pastoral districts and those farming districts in which livestock are kept in any considerable numbers were affected by drought. Coastal and sub-coastal districts received general rains commencing late in January. However, even in these districts the rainfall during the recognised wet season of the year was for the most part less than normal. It was sufficient to make good pasture growth but in some areas was insufficient to make adequate supplies of surface water available.

Further away from the coast, pastoralists were not so fortunate and drought or near-drought conditions continued for the remainder of the year. This applied to much of the sheep country proper, conditions being especially bad in the south-west, where mulga scrub feeding was resorted to in the second half of the year.

As a result of the poor seasonal conditions in the sheep country it is expected the number of lambs marked for the year will prove to be well down on that for recent years.

Chiefly owing to the falling off in supplies of fat cattle from the central and northern portions of the State, slaughterings of cattle for the year were down about 90,000 head on the previous year. The serious drought conditions in the south-west and far south-west had not affected the number of fat cattle trucked up to June 30; their full effect will be felt in 1958-59.

Plate 1 shows graphically how cattle slaughterings for export compared in the two years 1956-57 and 1957-58.

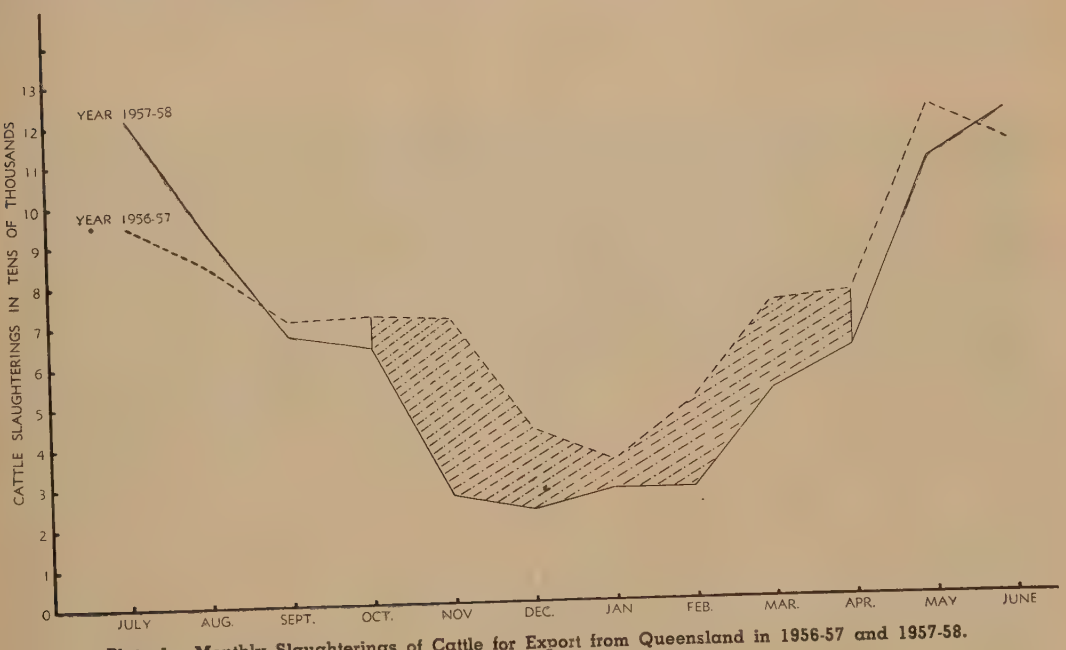


Plate 1.—Monthly Slaughterings of Cattle for Export from Queensland in 1956-57 and 1957-58.

Prices realized for fat cattle were generally higher than for several years past. This was due in some measure to the influence in the market of buyers catering for New South Wales requirements but probably was also a reflection of the overall reduction in numbers of fat cattle on offer.

In the dairying industry the effects of the drought conditions that operated in the first half of the year were expected to carry over into the second half, despite the improved conditions after January. This expectation was based on reports of shortened lactations of cows that calved during the dry months and of temporary infertility brought on by poor nutrition. However, in the final quarter of the year production was well above that for the corresponding one in 1956-57 and approximated that for the final quarter of 1955-56, which was a relatively favourable year. This better-than-expected result was almost certainly due to exceptionally mild weather conditions in May-June.

Slaughterings of sheep were up approximately 60,000, but this was attributable to a deliberate policy on the part of some owners of sending sheep forward for slaughter (to cut their losses) even when little more than skin values could be realised.

Slaughterings of pigs, too, were up (even though only slightly) on the previous year as a whole, but fewer pigs were taken through to

*Appointed Assistant Under Secretary (Technical) on June 26, 1958.

bacon weight. This can probably be taken as an indication that high feed costs had their influence on the production policy of pig producers. Prices obtainable for pig-meats were on the average down about 6½d. per lb. compared with the previous year. This was so despite the fact that during most of the year dairy by-products, fodder crops suitable for pigs, and grain were all in short supply and grain was very dear to buy.

Sales of wool fell by over 90,000 bales as compared with 1956-57 and realisations by approximately £25,000,000.

So far as the poultry industry is concerned, egg receivals by the South Queensland Egg Marketing Board constitute the great bulk of the State's production. These were down about 1,000,000 doz. on the previous year. The average net price paid by the Board to growers was approximately 5d. higher, at 3s. 6.86d., than in the previous year. This would have gone some distance towards meeting the higher feed costs which obtained during the year. Nevertheless, the number of poultry farmers registered with the Board showed an appreciable decline during the year.

Viewing the livestock situation as a whole for the year the effect of the drought is obvious. Of importance also, however, are the price trends that were manifest. Those engaged in wool and pig production seem to have been worse affected. Price rises for beef and eggs helped the cattleman and poultry farmer in some measure. From the State point of view the big drop in income from wool must be regarded seriously. It should be remembered, however, that the 1956-57 wool selling season was rather abnormal. In the first half of the season, much overgrown wool was received consequent upon delayed shearings. Towards the end of the season much prematurely shorn wool was received in addition from growers who were obviously taking steps to get back to their normal shearing time. Production was therefore higher than ordinarily would have been the case. The actual decline in production in 1957-58 therefore may not be as significant as appears at first sight.

FACILITIES FOR RESEARCH WORK.

The Animal Husbandry Research Farm at Rocklea was further developed during the year, the main item in this regard being the erection of a modern pig testing station. This building, although not ready for use at June 30, 1958, was complete except that installation of plant and certain plumbing and painting work were still proceeding. It is built after the Danish pattern and provides one-to-a-pen accommodation for 80 pigs. The design and site are such as to enable another wing to be added. The present 2-storey service section would then become a central service block for the pig accommodation wings on each side. The machinery and plant being installed in the building will have sufficient in reserve to cater for both wings. It is confidently anticipated that the Rocklea pig testing station will open up a new era for pig breeders who wish to improve their stock.

Plate 2.—The Department's Pig Testing Station at Rocklea.

On the poultry section a large modern intensive rearing shed was in an advanced stage of construction, as was also an incubator and brooder house. A row of breeding pens was half completed. The first-mentioned is in the area given over to random sample testing and is for use in connection therewith. The other two buildings are in the area given over to experimental work. Approval has been given for the erection of a further row of pens in the

random sample testing area. This row is expected to be erected early in 1958-59. Facilities available at the poultry section are approaching what can be regarded as reasonably adequate for present requirements.

No major building was undertaken on the cattle section, but yard accommodation, fencing and drainage were further developed. Plans were drawn up for a machinery shed and workshop.

At the Animal Research Institute, Yeerongpilly, a new small-animal block and a large well-equipped store were provided. An additional large modern autoclave was added to the equipment available in the laboratory.

The main laboratory nowadays houses members of the three research Branches—Pathology, Husbandry and Biochemistry—whereas a few years ago the Pathology Branch had the building to itself. Additional laboratory space has therefore become necessary.

Improvements are gradually being effected in facilities for animal experimentation on the Regional Experiment Stations but these are still not as well developed as could be desired. The piggeries at the Kairi, Biloela and Hermitage Regional Experiment Stations, for instance, lack facilities for the individual feeding of pigs on experiment, and so far only one of the Stations carries accommodation for poultry.

BRANCHES OF THE DIVISION.

The Division of Animal Industry now comprises seven Branches. Four of these are field Branches—viz., Veterinary Services, Sheep Husbandry, Cattle Husbandry, and Pig and Poultry—and there are three associated research Branches—Pathology, Biochemistry and Animal Husbandry. The research Branches are located at the Animal Research Institute, Yeerongpilly, and the nearby Animal Husbandry Research Farm at Rocklea as well as at the Animal Health Station, Oonoonba, Townsville.

The year under review represents the first full year that the three research Branches have functioned as separate units of the Division. It is also the first full year since the grouping of the former Pig Branch and Poultry Branch into a single unit. The indications so far are that the new arrangements are satisfactory, though final judgment should perhaps be withheld for at least another year. So far as the research Branches are concerned, it is nevertheless clear that the burden of administration that falls on each Branch head is now materially less than that carried by the former Director of Research.

Details of the work carried out in the several Branches will be found under the Reports of Branches. Some items from these reports may, however, appropriately be given special mention here.

At the Animal Husbandry Research Farm, Rocklea, work coming under the general heading of drought feeding of cattle has been continued. This work has as its ultimate objective the finding of ways and means of greatly reducing the enormous toll of breeders that drought takes over the years.

The use of bush (native grass) hay and sorghum silage in conjunction with urea has been examined with promising results. These results will be taken into the field and applied by the Cattle Husbandry Branch in trials on properties during the coming year.

A dairy bull proving project carried out jointly by the Animal Husbandry (Research) and Cattle Husbandry Branches in conjunction with the Division of Dairying has been taken a stage further. This project has been facilitated each year since its inception three years ago by moneys made available from the Commonwealth Dairy Industry Extension Grant. Artificial insemination is an integral part of the project and the experience gained in its use over the three years is proving most valuable in a wider sphere.

The deep interest of dairy farmers in artificial insemination is very obvious. So much is this so that on the Atherton Tableland producers have banded themselves together to provide their own service through a Co-operative Artificial Breeding Association. The Division's part in this will be to supply semen from the centre at Kairi Regional Experiment Station to inseminators employed by the Association, as well as to act in a general advisory capacity. An arrangement whereby producers take the initiative in matters of this sort is regarded as highly desirable.

Testing of dairy cattle for tuberculosis showed a marked falling off as compared with the previous year. Several factors were involved, but an important one was a reduction in the number of approved veterinary surgeons holding contracts with the Department for testing. A decline of interest in the scheme on the part of practitioners, which has been evident for some time past, is considered due in large measure to an ever-narrowing margin between costs of testing and receipts. Towards the end of the year an increase in the rate payable for each of the first 10 animals in a herd—from 5s. to 10s.—was effected. The rate for the remaining animals in a herd (2s. 6d. per head) was allowed to stand. The increase in receipts for testing which will result is expected to restore practitioner interest in the scheme and allow of the leeway being made up.

CHANGES IN DIVISIONAL OUTLOOK.

When the Division of Animal Industry was formed some 13 years ago, so much had to be done it was understandable that what appeared to be the most pressing problems were attacked first. There was, as would be expected, a tendency to undertake work that could be completed quickly and a reluctance at times to attack basic problems that had to be understood at least in part before more specialised work could be undertaken.

Fortunately, the heads of the various Branches were aware of this and guided their staff in such a way that some basic problems were at all times being examined and data collected whilst a leavening of shorter projects were being completed. This kept the staff

interested and keen in their work and prevented boredom and monotony. Great credit is due to the Branch leaders that so much was achieved in such a short time with so few men available.

Some of the Branches were quite new and others functioning for the first time in many districts of the State. It is therefore understandable that field experiments had to be undertaken in these districts before extension work was really commenced.

In these early days of the Division and of the new branches, field staff were more directly engaged than is at present the case in such activities as the Mules operation, drenching demonstrations, castration, spaying, caponising and the many skills that incidentally demonstrated the officers' efficiency. Good public relations had to be established and the staff were perfectly justified in using these methods to develop goodwill and a reputation which would lead the stockowner to seek their advice on other more important matters. Having done this, the staff had to commence to influence the farmer and grazier to use improved methods not as far as they concerned the individual animal but the herd as a whole. This meant exercising an influence over property management. The adoption of better methods of husbandry and disease control are of value only if they result in higher production or less costly production and where possible the transmission of the factors for high production to succeeding generations.

MEASURING ANIMAL PRODUCTION.

It is one thing to tell a man what he should do to improve his husbandry and another to demonstrate to him that new practices will put money in his pocket. To do this, systems of measurement have been evolved so that the results of the adoption of these new practices can be demonstrated.

Production has been measured in some ways since man first commenced to farm, but there has always been the grave doubt that such increases as have been achieved were due to improved nutrition and not to increasing capacity of the parent to transmit high production capacity to its offspring. Given food of the maximum quality and unlimited quantity, a beast will produce to its maximum capacity. This is called its genetic maximum, but from a full quantity of such fodder some animals will produce more than others, or in other words they have a higher genetic maximum. Similarly, if a number of animals are given the same quantity of food some will produce more than others. This is easy to measure, but it is not so simple to gauge the capacity of an animal to transmit these qualities to its progeny. There are, however, methods of doing this and these have now been developed and are being used by the research and advisory staffs of the Division, working in collaboration.

In the Cattle Industries.

The cattle industries in Queensland are faced with the problem of attaining a reasonably high level of production under environmental conditions which differ considerably from those of many other countries. In solving this problem, two methods of approach are being used. Firstly, the environmental conditions under which stock are raised can be improved by better nutrition, developed through use of improved pastures, crops for fattening, and, in some cases, supplementary feeding; and secondly, through selection of animals better adapted to the environment. A great deal of work is being done by Departmental officers on various methods of improving nutrition. In addition to overcoming the various problems associated with improved nutrition, it is still necessary to select the strains of animals that will give the best results from adequate nutrition in the Queensland environment.

Most of the breeds of cattle with high potential for either beef or dairy production have been developed in countries with temperate climatic conditions. In developing strains of beef and dairy cattle for Queensland conditions, it is essential that cattle should be selected not only for their potential for production of either beef or dairy products but also for their adaptability to environmental conditions under which commercial cattle are maintained. In essence, the problem is to select as parents animals capable of producing progeny which will give highest production under commercial conditions in Queensland.

The rate at which improvement in production through breeding methods can be obtained will depend largely on the number of factors for which selection is practised and the accuracy with which measurement of these factors is made. Emphasis on fancy points in various breeds can only lead to slower progress in selection for the more important production factors. In both beef and dairy cattle, improvement will be most rapid if selection is practised for factors of economic importance—milk or butterfat production in dairy cattle and rate of growth and conformation in beef cattle. Systems for accurate measurement and recording of production of these factors are now available to the beef and dairy cattle industries.

Bull Proving.—In the dairy industry, the combined use of artificial insemination, herd recording and an effective system of calf identification developed by the Department of Agriculture and Stock provides a sound basis for progeny testing of dairy bulls. A Bull Proving Project for bulls of the Jersey breed on this basis was inaugurated in 1955 and data on the production of the progeny of the bulls used in the first year will be available in 1959. A similar project is being commenced in 1958 with bulls of the A.I.S. breed. These projects will ensure that, when artificial insemination is firmly established on a commercial basis in Queensland, there will be available bulls which are known to be capable of raising production in commercial herds.

Production Performance Recording.—In beef cattle, estimates of heritability which have been made overseas indicate that differences in rate of liveweight gain in groups of cattle maintained under uniform conditions are very largely due to inherited factors. Because of this, selection of bulls for breeding on their own

liveweight performance should lead to more rapid improvement than can be achieved by selection on the basis of progeny testing of bulls. A system of selection on this basis—referred to as production performance recording—is widely used in the U.S.A. and has been instituted in some stud herds in recent years by co-operation between the Department of Agriculture and Stock and stud breeders.

The essential features of the system are that animals are identified at or as near as possible to birth and their dam and, if practicable, sire are identified. The rate of gain of groups of progeny of the same age group is recorded over a given period under uniform conditions and the animals are classified according to conformation. Each animal is then given a total score on the basis of its rate of gain and conformation and selection is based on this score. Records kept under this system also permit the selection of cows for future breeding on the basis of their fertility and ability to rear a calf to a good weight at weaning. This is a most practical breeding system for effecting improvement in characters of economic importance—namely, rate of gain, conformation, mothering ability and fertility—and is very easily adopted by any intelligent cattleman.

In the Sheep Industry.

Measurement as a critical scientific method of assessing the accuracy of observations plays a large part in the application of research to practical sheep breeding.

Fleece Measurement.—In recent years, fleece measurement has been used increasingly by sheep breeders as an aid to their selection of superior animals. This is not a radical departure from recognised methods but is simply an aid to selection. It can assist those who follow the orthodox methods to go ahead somewhat faster.

Clean scoured fleece weight is the keystone of fleece measurement. Fleece measurement finds by comparison those sheep that have a high commercial value and uses them as a nucleus in breeding programmes.

All the factors measured are purposely chosen because they are known to have high heritability. Factors measured are greasy fleece weight, percentage yield, clean scoured fleece weight, fibre diameter, staple length, crimps per inch, and ratio of wool and hair fibres. It is fortunate that they have a high heritability and can be measured accurately, because superiority in such factors has high commercial value. As ram ratio to ewes in flock breeding is small, but has a high influence on results, so the studmaster is able to help the flockowner to breed more commercially productive sheep.

To apply fleece production in the selection of rams, a group are first chosen by the usual methods, namely, visual selection and the examination of records of production. The rams are tagged and the fleeces are weighed at shearing. A mid-side sample of wool is obtained and along with a record of the weight of the fleece forwarded to the Department's laboratory. In a few weeks results are obtained by the laboratory, analysed by biometric methods and returned to the studmaster. Relying on his own observations and using the laboratory analyses embodying the best factors for heritability, the studmaster is thus able to plan a desirable breeding programme. The flock man who buys his rams gains much benefit by the use of rams obtained from studs practising fleece measurement methods. So far as breeding flock ewes is concerned, the only form of fleece measurement that is practicable is the weighing of fleeces at shearing and using the recorded weights to eliminate low-fleece-weight cutting ewes from the breeding programme.

In the Pig Industry.

Consumer demand to-day is for a fleshy pig of uniform type and this can only be produced by very careful selection, breeding and proper feeding.

In the past the show-ring was the main guide to type and even to-day the merit of studs is assessed chiefly on the basis of show-ring awards. Show awards, however, do not indicate the capacity of animals to transmit their carcase quality to their progeny. Thus, their major drawback is that awards are made entirely on appearance and are apt to give minor non-commercial characteristics more emphasis than they deserve at the expense of such others as the production of good quality meat and the development of correct proportion of backfat, body length, etc.

Selection of breeding stock is still largely made on appearance and on this basis the chance of selecting a pig which has desirable commercial characteristics is not the best. Furthermore, there is no guarantee that such animals are capable of producing offspring which will yield carcases suitable for present-day market requirements.

Various methods of overcoming the difficulty of selection, such as grading and litter recording, have been applied with some measure of success, but these do not fully meet the requirements and have not been generally accepted by the industry.

Pig Testing Station.—Pig testing, on the other hand, offers an opportunity for the sound selection of breeding stock and it is expected that once testing has been properly established in Queensland there will be a marked improvement in the quality of the pigs produced and a considerable reduction in production costs.

Pig testing has been in operation in Denmark for approximately 50 years and the benefits which the Danes have secured in the way of economy of food conversion, speed of growth, improved uniformity and carcase quality are well known.

The Department of Agriculture and Stock has established a Pig Testing Station at Rocklea in which ideal conditions for testing have been provided.

The basic aim of testing pigs—namely, the measurement of the extent to which a boar transmits commercially important characteristics to his offspring—may be considered under three main headings:—

(*a*) Characteristics primarily important to the pig producer.

(*b*) Characteristics primarily important to the curer.

(*c*) Characteristics primarily important to the consumer.

Under the first heading the main two points are speed of growth and economy of food conversion. The importance of these points need not be elaborated, but it must be stressed that approximately 75 per cent. of the cost of production is represented by food.

The second heading applies particularly to bacon, because curers are anxious to develop a product that is of uniformly high quality. The retailer, quite reasonably, requires as large a proportion of the carcase as is possible to be of the highest priced cuts, with the right proportion of lean meat to fat. Testing aims at ensuring this by actually measuring the ratio of lean to fat.

The housewife is the one concerned under the third heading. She is interested in the price of bacon and the proportion of edible meat therein. Testing aims to measure not only the proportion of fat in the whole carcase but also the way in which it is distributed.

The objective of testing as a whole is to find boars that produce strains of pigs which are economical to the producer and at the same time satisfy the curer, retailer and housewife.

Testing is carried out by feeding the progeny of a boar from a number of litters. Two barrows and two sows are selected from each litter and run from weaning until they are baconers under standardised conditions of housing, feeding and management, the objective being to eliminate all variations due to environment and leave only inherited variations. When they have reached bacon weight, the pigs are killed, dressed, weighed and measured. The results can be used to sort out those boars which are transmitting hereditary factors necessary for the production of the correct type of pig.

The main advantage which testing will give to the pig producer, over the present system of selection of breeding stock, is that it will provide authentic facts and figures upon which breeding operations may be based, in place of guesswork which is largely the basis at present.

As it is expected that the number of high quality proven sires will be small, it will no doubt be necessary eventually to use artificial insemination to obtain full value from proven boars.

In the Poultry Industry.

Random Sample Testing.—Random sample tests are to-day enjoying widespread popularity amongst farmers, breeders and geneticists.

From the view point of the commercial poultry farmer, the random sample test indicates where he can purchase his replacement stock to best advantage. For the breeder the random sample test provides an indication of the merits or defects in his breeding flock compared to other similar flocks and indicates where improvement is necessary. To the geneticist, the random sample test is an important tool with which to measure the rate of genetic improvement in those flocks in which breeding programmes are being actively pursued.

Whilst egglaying competitions and random sample tests have essentially common objectives—namely, the production of more profitable poultry for the industry and the evaluation of the productive performance of stock available at present—the main difference is in the design of the test.

Egglaying competitions have fallen in favour during the past 20 years and their place and importance are being taken by random sample testing. Such testing, based as it is on mathematical concepts, ensures that the sample represents a fairly accurate cross-section of the flock. For this reason, above all else, random sample test results are a far more reliable guide than results from egglaying competitions. In such competitions, few birds are tested and these are selected individually by the breeder and are not necessarily representative of the flock. Indeed, an unscrupulous breeder could obtain proven stock and enter them in his own name.

Random sample testing is now being carried out at the Poultry Section at the Department's Rocklea Animal Husbandry Research Farm. These tests are an integral part of the Queensland Poultry Improvement Plan, for poultry breeders co-operating in this scheme must submit annually a random selection of hatching eggs from the breeding nucleus on their farms. A total of 180 hatching eggs is selected with the aid of random tables prepared for each farm by a biometrician.

Each batch of eggs is incubated at the same time in one machine at Rocklea. Even the initial positions of the trays in the incubator are decided by random selection and during the 21 days of incubation each breeder's group of hatching eggs occupies three different positions in the incubator to counter any possible effect of variation in temperature, humidity or ventilation.

At hatching, all groups are sexed and only the pullet day-old chickens are retained. These are identified by wing-banding and toe-marking according to their respective parent breeding flocks, but all are reared together under the same environmental conditions. Standard procedures for feeding, disease prevention and weaning are adopted.

At 18 weeks of age, the surviving pullets are penned according to their group and reduced by random selection to groups of 40 pullets. Each group of 40 pullets is then divided into two replicate groups of 20 pullets, which are housed in separate pens. These groups are then tested for egg production for a period of 48 weeks.

In the random sample test now being conducted at Rocklea, economic factors such as egg production, deaths during the laying, brooding and growing periods, egg size, egg quality and hatchability are being evaluated. These results are related to a set of "standards of excellence" which are minimum targets for the factors enumerated above. If the average results of three consecutive random sample tests on a breeder's entry can reach or exceed these targets, he will be entitled to have his breeding flock styled as a "Government Approved Poultry Breeding Flock".

It will thus be seen that random sample testing in Queensland provides a measure of the genetic improvement taking place in the State's poultry stock through improved breeding techniques in individual flocks. Such improvement will eventually be channelled to the commercial farms through hatcheries working in close association with the breeding flocks.

STAFF.

The staff position was rather more stable than for some years previous. Nevertheless, four graduates, one diplomate, two members of the advisory staff, six inspectors and three laboratory assistants resigned.

Losses of senior staff from the previous year were keenly felt, but officers who took over the vacant positions have worked hard to ensure that existing services were at least maintained at the same standard as before.

DIVISION OF DAIRYING.

Director: Mr. E. B. Rice.

Below-average rainfalls recorded in dairying districts until April resulted in seasonal conditions for dairying being even more adverse than in the previous year. Good soaking rains which fell in June replenished surface water supplies, stimulated pasture growth and enabled plantings of fodder crops to be made.

A disturbing feature during the year was the collapse in prices for the exportable surplus of butter and cheese consigned to the British market, where there was a heavy over-supply. An increased inflow of dairy products from Europe and a steep rise in the United Kingdom domestic production of cheese were chiefly responsible for this situation in Britain. Butter prices there reached the lowest level since 1951 and cheese prices also declined sharply.

The production records and equalisation returns for butter and cheese for the past five years, shown in Table 1, depict the combined influence of the two factors just mentioned on the dairying industry of Queensland during the past two years.

TABLE I.

PRODUCTION AND EQUALISATION VALUES OF BUTTER AND CHEESE.

Year.	Butter.	Equalisation Price.	Cheese.	Equalisation Price.
	Tons.	Per cwt.	Tons.	Per cwt.
		s. *d.*		*s.* *d.*
1953–54	41,798	400 5	6,746	232 5
1954–55	45,915	395 10	7,921	220 2
1955–56	48,189	400 10	7,580	262 4
1956–57	41,089	392 7	7,137	209 8
1957–58	32,280	365 4	5,174	212 8

The value of the output of butter for the year is estimated to be at least £5,000,000 lower than in 1956-57. World output of butter during 1958 is expected to rise. As a consequence, difficulty will still confront the exporting countries. Strong representations were made to the British Government on behalf of the Commonwealth exporting countries with a view to action being taken towards reducing the inflow to the United Kingdom of dairy products from countries which are subsidising exports to that market. Available information suggests that action will be taken by Britain which will cut imports from these countries by about 40,000 tons during the next year, but even this will afford only partial relief and prices realised in Britain are predicted to continue to be appreciably below production costs in Australia.

Governments and industry organisations in some of the major dairying exporting countries of the world have implemented schemes to reduce the local prices of butter and cheese in order to stimulate domestic sales and help meet the difficulties which face their exports on the British market. They have also raised the legal minimum fat percentage of market milk and taken other measures designed to curtail butter production. Extensive publicity and advertising in these countries and in Britain are also being promoted for the purpose of increasing consumption of milk and milk products.

Within Australia, the industry organisations have drawn up proposals to stimulate local consumption and to extend research. The Australian dairying industry is concerned at the falling *per capita* butter consumption in Australia. From about 30 lb. in 1954-55, it has declined to about 27.5 lb. Legislation to bring the scheme into operation will need to be passed by the Commonwealth Government. The scheme would be financed by levies of $\frac{1}{8}$d. per lb. butter and $\frac{1}{16}$d. per lb. cheese and a Commonwealth subsidy.

Reports of field officers show that due to the uncertain outlook for butter and cheese in the immediate future there is a tendency for farmers to divert from dairying. This is more evident in the sub-coastal districts, where a complete or partial changeover is more readily practicable than in the coastal dairying districts.

The Commonwealth Government renewed for a further period of five years from July 1, 1957, its legislation which provides for the payment of a guaranteed price to producers for butter and cheese consumed within Australia plus exports up to 20 per cent. of domestic consumption. It also renewed the Commonwealth Dairying Industry Extension Grant for a period of five years from July 1, 1958.

The Commonwealth's guaranteed price to producers for the ensuing year is 2d. per lb. higher than in 1957-58. The Australian Dairy Farmers Federation made a submission for the price to be based on a farm cost of production assessed by the Federation at 52.88d. per lb. commercial butter, compared with the Government guarantee of 51d. during 1957-58.

During January to March the writer was absent from Australia for the purpose of carrying out on behalf of the Food and Agriculture Organisation of the United Nations an assignment to formulate an overall dairy development programme for Pakistan and to make some observations on milk schemes in India.

MILK AND MILK PRODUCTS.

Butter.

Of the total production of 32,280 tons of butter for the year, 21,463 tons were officially graded. The results were 32·8 per cent. choice, 54·8 per cent. first, and 12·4 per cent. below first grade. Inadequate water supplies, less frequent deliveries of cream than in a normal year and hot dry weather caused the percentage of choice butter graded for the year to decline below that of the preceding year, which was 34·3 per cent.

Factory buildings and equipment were maintained in good condition and an estimated amount of £144,600 was spent on factory renovations and new equipment. Interest continues to be shown in the replacement of existing wooden churns by metal churns, and when outstanding orders are filled during the coming year there will be at least 10 metal churns installed in Queensland factories. Apart from their longer life they offer advantages from the hygienic viewpoint. Further installations of modern pasteurisation equipment capable of intensive treatment of cream supplies for the removal of "off" odours were also made, and a number of factories installed equipment for eliminating extraneous matter from cream prior to churning. Several factories which have installed more efficient pasteurisation plant in operations; their cream supplies were diverted to neighbouring factories.

The centralisation of factories continues in order to keep manufacturing costs as low as practicable. During the year the Lowood and Ravenshoe butter factories discontinued operations; their cream supplies were diverted to neighbouring factories.

Cheese.

Apart from seasonal conditions, the heavy demands on cheese factories to maintain Brisbane and other town milk supplies during the drought caused a marked decline in cheese output, which was 5,174 tons, compared with an

Plate 1.—The New Cheese Factory of the Southbrook Co-operative Dairy Association.

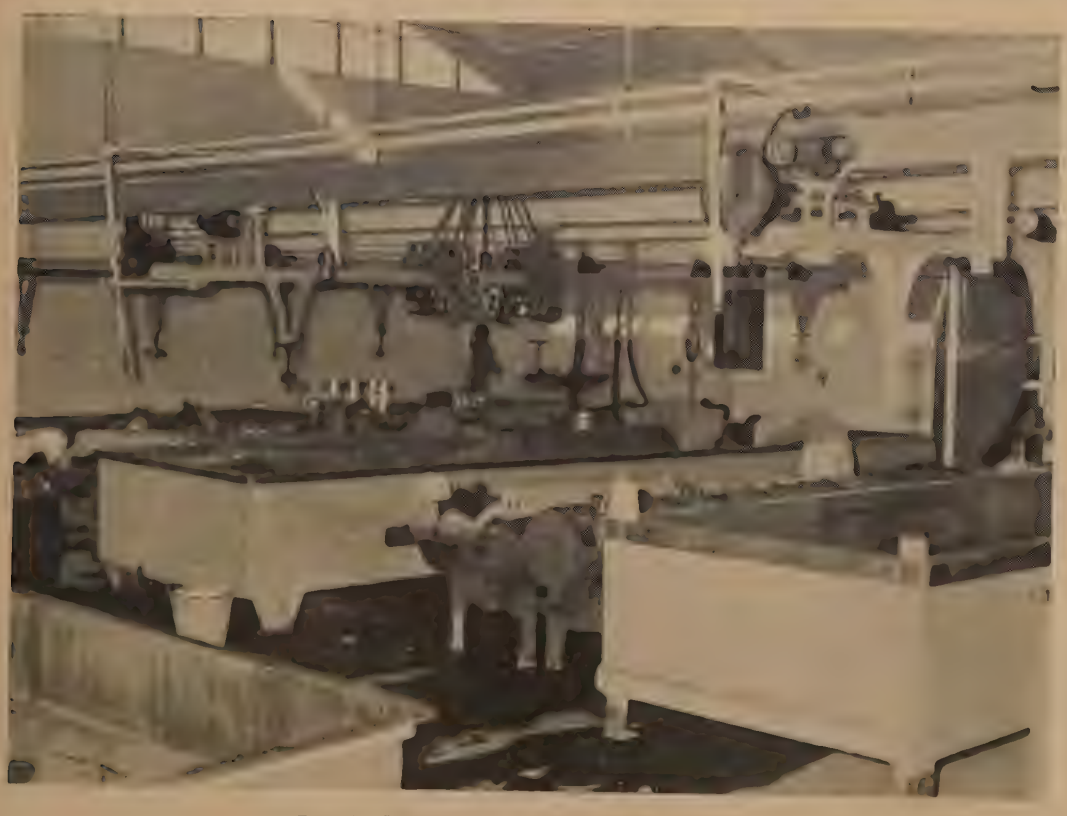


Plate 2.—Interior of the Southbrook Cheese Factory.

average yearly production of 7,765 tons for the past five years. A most gratifying accomplishment was that, despite the unusual difficulties of the year, the grading results were the best yet recorded in Queensland, the choice and first grade representing 88·2 per cent. of gradings. This is attributable to a positive approach by the cheese industry itself in recent years to quality improvement, and to the regulations gazetted under the Dairy Produce Acts during the year which provided for the grading of milk supplies at cheese factories by the methylene blue test and a price differential of not less than 2d. per lb. butterfat between first and second grade milk.

Two cheese factories ceased operations, but the milk supplies which were formerly received by them were diverted to neighbouring factories. The cheese section of the Warwick Co-operative Dairy Association was destroyed by fire but it should be rebuilt by December 1958. A new cheese section at the milk factory of the Caboolture Co-operative Dairy Association at Woodford commenced operations during the year.

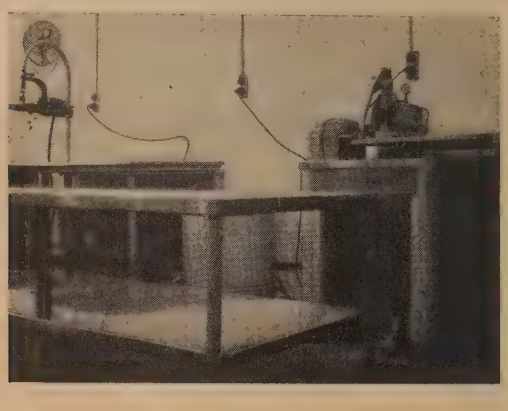


Plate 3.—A Modern Cheese Packaging Plant.

Among the progressive measures which have been widely adopted in cheese factories during recent years are improved waxing, the packaging of rindless cheese for local trade, the manufacture of a somewhat lower moisture content cheese of better quality, and the installation of modern equipment aimed not only at improving quality but at reducing costs of manufacture and relieving operatives of some of the fatigue associated with older equipment. Refrigerated cooling of cheese-holding rooms has also assisted in attaining the progressive improvement in quality of the past few years.

Varieties other than cheddar cheese are made in several factories, two of which commenced to make these alternative varieties during the year.

Market Milk.

Milk supplies for direct consumption were well maintained throughout the State, although this was only possible at times by obtaining accommodation milk from cheese factories and long haulages by rail. During one period a few consignments were sent from Caboolture to Cairns, a distance of 1,005 miles. Sixteen factories supplied pasteurised milk to most of the larger cities and towns and their environs.

A development of recent years has been the establishment of milk bottling depots in western towns. The milk is railed to them from dairying districts considerable distances away. Depots at Charleville and Cunnamulla, which obtain milk supplies from Toowoomba, were opened during the year, and supplies will shortly be sent from Rockhampton to Winton.

Milk consumption in Brisbane during the year rose to about 18,500,000 gallons. About £90,000 was expended on the installation of new equipment in milk factories.

Suppliers' Returns.

The average payout to suppliers to butter factories was 3s. 4½d. per lb. commercial butter, to cheese factory suppliers 4s. 3d. per lb. butterfat, and to metropolitan suppliers for milk pasteurisation 3s. 7½d. per gallon, equivalent to 9s. 2d. per lb. butterfat for milk of an average butterfat content of 3.8 per cent.

DAIRY PREMISES AND FARM PRACTICES.

Satisfactory progress was made in the improvement of farm dairy buildings and equipment, 276 new dairy sheds being constructed and 364 renovations of existing sheds being made. A plan for the herringbone type of dairy building was prepared by the Architectural Branch of the Public Works Department in consultation with Divisional officers. Copies are being printed for distribution. It is expected that the convenient and speedy milking practicable in this shed design will lead to a growing interest in its construction by farmers milking large herds.

As electricity extends into rural areas its convenience for providing the motive power and hot water supplies in dairy buildings is appealing to farmers. Machine-stripping in substitution of hand-stripping for machine-milked herds continues to make headway, about 28 per cent. of farmers having now discontinued hand-stripping. Provided the milking machine is in good mechanical condition, machine-stripping saves time and labour. The availability of in-place equipment for the cleaning of milking machines is stimulating an increased adoption of this practice, but it is evident that advisory help is needed to ensure that it is properly applied to attain the desired objective of simpler, faster cleaning allied with quality improvement. There are about 1,200 milking machines now equipped with accessories to permit this system of cleaning.

Over 440 milk and cream refrigerators were installed during the year, bringing the total on farms to about 2,150. Unquestionably, adequate cooling can be a most potent factor in attaining better quality dairy produce in the warm environment of Queensland. Cheaper alternatives can give reasonably good results (though they are not as efficient as refrigerators), and about 100 of such installations were made on farms.

Developments which have taken place in regard to milking machines include the remodelling of two makes, the replacement of metal milk pipelines with pyrex glass tubing, and the use of in-line cleaning accessories. Many of the 763 milking machines tested by field officers by means of testing equipment now available to them were found to have some mechanical defect which impaired their milking efficiency. A noticeable improvement has taken place in the quality of milking machine rubberware since a regulation was promulgated requiring it to be branded by the manufacturer.

About 25 per cent. of dairy-farmers have now changed to a seasonal calving pattern in their herds as a result of the disclosure by herd recording data that highest production during the ensuing lactation can be achieved by calving cows in the third quarter of the year.

Fodder reserves on farms were almost completely exhausted by March, but after the drought broke efforts were quickly made to replenish supplies. Reports from field officers suggest that greater amounts of conserved fodder than in previous years will be on farms in the ensuing year; an estimated 132,000 tons of hay, silage and grain was reported to be held on farms at the close of the year.

The renewal of the Commonwealth Dairy Industry Extension Grant will enable a continuance of Divisional activities which are proving beneficial to dairy farmers. Projects during the new term are primarily concerned with assisting farmers to achieve lower costs of production. Totals of 131 demonstrations on pastures and fodder conservation and 83 on quality improvement are in progress.

HERD PRODUCTION RECORDING.

Grade Scheme.

The average yield of 59,711 cows recorded was 351 gal. milk and 149 lb. butterfat. This is slightly below the previous year's average, but is satisfactory in view of the seasonal conditions. Herd recording has obviously encouraged many farmers to provide fodder reserves to tide them over periods of pasture scarcity.

Farmers were issued with progressive monthly production totals, a simple shed sheet to help in keeping better records of each cow, and a monthly publication titled "Recording Notes," all of which are widely appreciated and help to strengthen the service given by the Department.

Surveys which are made on data available from recorded herds provide useful guidance on various phases of herd management. Surveys were made of 139 bulls to determine their production-transmitting ability: 45 were raising herd levels, 63 maintaining them and 31 lowering them. Farmers are becoming increasingly aware of the need to keep better records and this will stimulate a greater demand in the future for sire surveys.

Positive calf identification is also an essential for herd improvement and in recorded herds the new calves are tattooed by the recorder during his monthly visit.

An examination of data has shown that even during an adverse season higher yields are given by cows which calve in the third quarter of the year. A study of the effect of the dry period between calvings has shown that it should be at least four weeks, but if longer than this there is no apparent benefit in the ensuing lactation. The information derived from this survey suggests that the treatment of the dry animal, particularly its plane of nutrition, is more important than the actual length of interval in affecting its productive performance during the ensuing lactation.

The North Queensland Dairy Extension Advisory Committee co-operated with officers in a survey to determine the factors affecting levels of production in herds. It was revealed that among the higher producing herds there was a wider adoption of seasonal calving, sire control, record keeping, better pasture management and supplementary feeding than among the lower-producing herds.

At annual meetings of herd recording groups the theme of the talk by Divisional officers was calf identification as an aid to keeping reliable records. Coloured transparencies were used to illustrate the talks, which were attended by 1,777 farmers.

Purebred Scheme.

Production recording provides fundamental information for assessing productive capacity of cows and the transmitting ability of dairy bulls. Improvement of the genetic quality of dairy cattle rests firstly on the stud breeders who breed and supply the bulls used in commercial herds. Stud breeders should obviously record their herds in order to assist them to attain the desired superior genetic quality. Unfortunately, less than 10 per cent. of the registered breeders of dairy cattle in Queensland are at present production-recording their herds.

A total of 1,972 cows in 118 herds was recorded, compared with 2,248 cows in 119 herds in 1956-57. The number which produced the prescribed standards for entry into the Advanced Register of the various dairy cattle breed societies was 660, and 112 qualified for entry to the Register of Merit.

Stud goat herds recorded numbered 12, compared with seven in 1956-57. The average yield was 144 gal. milk and 56 lb. fat.

EXTENSION ACTIVITIES.

The objective of the Division has been to intensify its extension programme by making more contacts with farmers than is possible by farm visits alone. During the year 21,463 farm visits were made, and 15,768 farmers were present at meetings in which various forms of extension media were used; in addition 9,782 farmers called on officers for discussion. All forms of group extension media were freely availed of by officers.

Five new sets of slides on various subjects were prepared by officers for use at illustrated talks. Coloured transparencies now available in the Division for use by field staff number 1,058.

Dairy Extension Advisory Committees, which consist of three Departmental officers and district councillors of the respective districts of

the Queensland Dairymen's Organisation, have now been formed in nine districts. The consolidation of Departmental-industry co-operation in furthering the extension activities of the Department, which was the object of their establishment, is undoubtedly being achieved, and the committees are also stimulating a harmonious relationship between the farming community and the officers. Most of the Committees receive much help from the country press, which publish weekly articles on behalf of the Committees.

Advisory articles in the *Queensland Agricultural Journal*, radio talks and press releases totalled 70 and 13 papers reporting the results of investigations were prepared.

RESEARCH.

Investigational work of the Division during the year was mainly centred on the manufacture of slightly acid flavour types of salted and unsalted butter, extraneous matter in cream and butter, quality aspects of raw and pasteurised milk, cheese manufacturing problems, cheese packaging, and the improvement of the compositional quality of milk. These investigations were aimed at further improving the quality and consumer acceptability of milk and milk products. Better utilisation of the milk solids and efficiency and economy of processing were the objectives of other projects. A pleasing feature was the co-operation received from the industry in placing facilities in factories at the disposal of officers after initial laboratory trials had indicated the desirability of extending them to commercial practice.

The Butter Marketing Board sought Departmental assistance in developing a butter which resembles the Danish type, in view of the likely greater acceptance of this type in preference to the typical Australian-type butter by the appreciable migrant population. Preliminary trials indicated that this kind of butter lacked good keeping quality under Queensland conditions, but a cultured unsalted butter having good keeping quality but lower acidity could be produced. Limited trial sales showed that this butter appears to have consumer acceptance. The keeping quality of slightly acid, salted butter was unsatisfactory if ordinary factory salt was incorporated in it, but if the salt was first treated with soda ash and then finely ground the butter was not detrimentally affected in quality. The Butter Marketing Board arranged for two factories to make some quantities of this type of butter, which, after blending with conventional Australian butter, is now on the market to assess public reaction.

The presence of extraneous matter in butter is viewed with concern on the United Kingdom market, and butter samples are now regularly examined for such by the Commonwealth grading staff and under the Butter Improvement Service conducted by the Division. With a view to minimising such contamination, investigations were undertaken to determine suitable methods of filtering cream in factories. The filter must have the ability to allow free passage of the fat globules but at the same time remove extraneous matter from the cream. The results show that efficient filtration is practicable with commercially available cream filters, but they are expensive. The Butter Marketing Board and Divisional officers have developed a filter which should be sold at a lower price. Simple methods using nylon cloth have also been devised which give satisfactory results and, as a result, factories should be able to exclude extraneous matter from butter.

Traces of copper and iron contamination from farm and factory equipment lower the keeping quality of butter during prolonged cold storage. The widespread use of stainless steel in factories has to some extent overcome the problem in recent years, but investigations have shown that some cream pumps, wash water and butter wrappers may cause metallic contamination. The milking machine and other utensils are chiefly responsible for iron contamination occurring on the farm.

Studies on the problem of a decline in both the solids-not-fat and the fat content of milk during the normally dry late winter and spring months in Queensland were continued. Not only does it cause concern to market milk suppliers in ensuring that milk produced by them satisfies the minimum legal standard of composition but it also affects the cheese-yielding capacity of milk. It seems apparent that in Queensland the low nutritive status of dairy herds during the months referred to is responsible for the decline in the compositional quality of milk. However, by attention to certain herd management practices the market milk supplier may often surmount the problem.

The production of cheese of somewhat lower moisture content than normal has been found to improve the grading quality, but an additional return of about 4s. per cwt. would be needed to offset the loss in cheese yield. However, the proposal now under consideration by the Australian cheese industry to base equalisation payments for cheese on a grade point scoring system may well lead to the necessity for factories to secure as high grade points as possible and thus make economical the production of a lower moisture content cheese. A very considerable expansion in the packaging of rindless cheese for sale on the local market took place during the year. Monthly sales by one factory rose during the year from six to 36 tons. Undoubtedly, this forward step in cheese merchandising will continue to develop rapidly and should also promote sales. Some manufacturing problems which arise in producing cheese suited to this trade are under investigation.

The investigations on market milk were concerned chiefly with the production of reconstituted milk, a keeping quality test for pasteurised milk applicable to Queensland conditions, and certain organisms which undesirably affect the keeping quality of pasteurised milk. It was shown that better quality reconstituted milk is obtained if the solids-not-fat content is rather higher than in normal milk and, after reconstitution, the milk is held about 30 hours for complete rehydration of the protein. Modifications of the British keeping quality test for pasteurised milk which were developed should prove more suitable for Queensland conditions.

In the programme of investigations connected with dairy farm hygiene, emphasis continues to be placed on improved farm detergents and chemical sterilants, dairy rubberware and cooling of milk and cream by refrigeration. The cleaning of milking machines by alkali-mixtures six days weekly and a dilute acid solution once weekly was found to be more effective than alkali cleaning alone. However, a systematic, twice-daily cleaning routine is essential. Further confirmation of the greater life of dairy rubberware compounded from a mixture of synthetic and natural rubber over such equipment made wholly from natural rubber was obtained. Trials with an imported in-can farm refrigeration unit installed in a farm-built concrete cabinet demonstrated the efficiency and operating costs to be equivalent to, and the capital costs much lower than, conventional farm refrigerators. Trials with a solar water heater

Plate 4.—A Solar Water Heater Installed on a Dairy Farm.

indicated the necessity for modifications to improve its efficiency. The system offers promise in cheapening water-heating costs, as water at a temperature up to 150 deg. F. obtainable by solar energy suffices for all cleaning operations other than final sterilization.

LABORATORY CONTROL SCHEMES.

The Queensland dairying industry has been well served for many years by the quality control schemes conducted by the Division. However, there are limitations to the service which can be given in this way for the efficient day-to-day control necessary, particularly to factories engaged in multi-product handling. It is pleasing to report that several associations have in recent years equipped and staffed their own laboratories and even smaller single-unit factories have provided equipment to enable more effective control of the quality of the milk intake and some aspects of processing. An extension of this practice is desirable, for under existing circumstances in the industry increased laboratory control measures can be of material help in assisting to achieve economy of processing and quality improvements.

Adverse seasonal conditions posed a problem in maintaining milk quality. Nevertheless, compared with the preceding year, there was actually a slightly lower percentage of methylene blue tests made at market milk factories which failed to comply with the standard set for advisory purposes, although there was a rather higher proportion of sub-standard fat content milks, due to the prevailing inadequacy of fodder supplies for dairy herds during the drought.

Tests of all products and other materials performed in the laboratories totalled 130,000, while the milk factories carried out over 370,000 methylene blue tests and 107,000 fat tests. With a view to improving the quality of milk for pasteurisation there was a threefold increase in tests for thermoduric organisms, high counts of which in a sample of milk are indicative of some fault in hygiene. Examinations of pasteurised milk samples revealed an improvement in quality. The routine laboratory examination of butters continues to provide helpful guidance to factory managements in the control of the compositional quality of butter and the hygiene and efficiency of processing.

STAFF.

The enthusiasm and initiative of the staff generally in the performance of their duties throughout the year is recorded.

DIVISION OF MARKETING.

Director: Mr. H. S. Hunter.

Drought conditions caused a serious decline in farm incomes during the year and although there was a rapid improvement in seasonal conditions over the greater part of the State later in the year economic recovery has been adversely affected because of rising costs and deterioration in overseas markets. The significance of these two influences on farm income lies in the apparent long-term nature of the situation—which means that farmers are facing a period of difficult adjustment at both individual farm and industry organisational levels. This is emphasising better business management of the farm itself and progressive policies designed to meet the new market conditions. Both of these trends are having a marked effect on the work of the Division in the spheres of economics and marketing.

As the report of the Marketing Branch shows, economics work in the field was stepped up so far as was practicable and towards the end of the year a new branch of the Division, to be called the Economics Research Branch, was created to deal with work of this kind.

ECONOMIC CONDITIONS.

Most European countries have settled down to a long-term policy of protection of their own farm production, including subsidies on exports. This, combined with improved techniques and the surplus disposal policies of the United States of America, has resulted in a substantial increase in the flow of goods onto the world's markets to meet a spending power which generally has recently tended to slacken. Price falls have, therefore, been inevitable and so far as any normal future is concerned no immediate recovery is indicated unless overseas monetary trends are reversed because higher interest rates in the United Kingdom and a lower rate of economic activity in the United States have been important contributory factors to the world economic position.

The basically competitive nature of the market must therefore be accepted. Price, quality, modern merchandising and vigorous selling policies will all play an important part in holding existing customers and acquiring new ones.

The farm cost situation within Australia has not deteriorated at the same rate as prevailed in some previous years and a few cost groups such as seeds and chemicals have declined in price overall. Others such as machinery, fertilizer and labour have increased and the drought caused considerable increases in grain and fodder prices, so that the general trend remains upward, just as the general trend of farmers' returns is downward. Apart from immediate disabilities, such circumstances lead to serious long-term consequences in that the return on capital invested by farmers is falling to dangerously low levels. This discourages new investment, and to the extent that modern cost-reducing techniques require heavier investment than old methods of farming, industries are placed at a disadvantage with overseas competitors.

ECONOMICS RESEARCH.

The challenge of rising costs requires that the utmost should be done to accelerate the adoption of proved techniques. Farmers, extension workers and various authorities, therefore, need facts and figures which will enable new methods to be assessed in terms of profit and loss. There are also needed the data which will provide a picture of trends and variations in various industries. The creation of a new branch in April, 1958, under the direction of Mr. C. H. Defries, was a step towards meeting the needs of this situation.

The Economics Research Branch has yet to be staffed, although as indicated in the report of the Director of Economic Services some projects have been initiated with the aid of personnel on loan from the Marketing and Dairy Field Services Branches. Long-term arrangements for staffing include the granting during the year of two University scholarships in Economics.

Current projects include a survey of the economic structure and trends in the wheat and associated industries. This was requested by the State Wheat Board and will be carried out in conjunction with the Council of Agriculture on the same basis as the survey of the pineapple industry, a full report on which was published during the year. These surveys do not attempt to provide specific costs of production but focus attention on the variations of capital and income structure under various conditions of farm size, geographical location and farm enterprise pattern. As was demonstrated by the wide use made of the Pineapple Industry Report, this type of information can help to clarify many issues and enable decisions to be reached in the light of authoritatively established facts.

Other projects include feeding management investigations in the dairying industry and the economics of soil conservation.

MARKETING.

The report of the Marketing Branch outlines the efforts being made by marketing organisations to adjust policies to meet the more competitive conditions of the present-day market. The importance of stabilisation schemes is given added emphasis by these circumstances. Discussions and conferences took place during the year

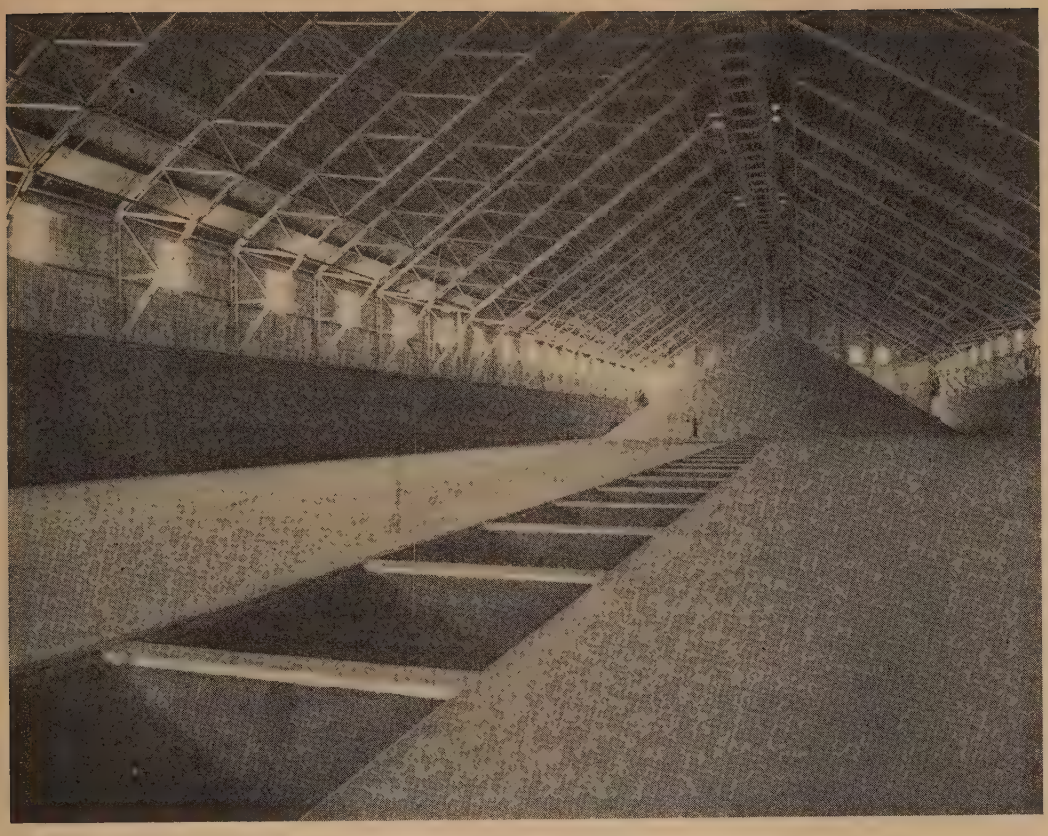


Plate 1.—Storage Shed for Bulk Raw Sugar at Lucinda, North Queensland. Mechanised loading plant on an adjacent wharf loads ships at 600 tons per hour.

in connection with the existing Wheat Stabilisation Plan which concludes with the 1957-58 crop, and a new plan to take its place for a further period of five years is being formulated.

The fall in wool prices from an average of 79·66d. per lb. greasy in 1956-57 to 62·27d. in 1957-58, together with weak and uncertain markets for small grains, is resulting in an expansion of the wheat industry and further efforts are being made by the State Wheat Board to meet expected production by stepping up its already extensive programme of providing facilities for bulk handling and storage. The retirement of the General Manager of the Board, Mr. C. C. McKeon, marked the close of 31 years' service to the Board, during which time great progress has been made in the development of wheats of high protein quality and an efficient system of wheat handling and storage.

The dairying industry has had to give consideration to plans to meet the drastic falls in overseas butter and cheese prices, which at a little above 200s. per cwt. for butter and 150s. per cwt. for cheese are now at the level prevailing in the early post-war years. The Australia-wide organisation of the industry, which enables an Equalisation and Stabilisation Scheme to operate, has therefore become of special importance, as the maintenance of orderly marketing is essential. Only by this means can the industry continue to have the benefits of cushioning market fluctuations and of the long specialised marketing experience of industry leaders who are in a position to understand the complex ramifications of local and world markets.

The death of Mr. T. F. Plunkett on Dec. 24, 1957, marked the passing of one of the dairying industry's great leaders who spent a lifetime in the interests of co-operative organisation and orderly marketing. He was one of the pioneers of the Queensland system, being a prominent figure in the conferences of the early 1920's when the framework and principles of the present marketing legislation were being hammered out. He was a member of the Provisional Council of Agriculture in 1922, represented the South Coast District on the first Council in 1923 and became Vice President in 1924. His career in Federal and State organisations was distinguished by sound leadership, as is indicated by the important role he played as one-time Chairman of the Australian Dairy Produce Board and Chairman of Directors of the Commonwealth Dairy Produce Equalisation Committee. He was a member of the first Butter Marketing Board in 1925 and continued his service to that organisation throughout his life.

Following their assumption of responsibilities as Ministers of the State Government, Messrs. O. O. Madsen, M.L.A., and A. G. Müller, M.L.A., retired from their positions on the Butter Marketing Board.

The Barley, Grain Sorghum, Peanut and Egg Boards were given additional powers during the year under the amended Primary Producers' Organisation and Marketing Acts to facilitate the operation of their marketing schemes by providing for a more effective supervision of the transit and delivery of commodities. The Wheat Board was also given similar powers under the Wheat Pools Act.

Proposals are under consideration for the setting up of a field organisation by the Egg Marketing Board following discussions with the Council of Poultry Farmers Organisations and the Board. This is being designed to facilitate the discussion of poultry industry problems by farmers and to provide a closer link between individual producers and the Board in matters of general interest within the industry.

The onion industry has sought the formation of an Onion Marketing Board following the experience of acute market disabilities during the year.

The Cotton Guarantee of 14d. per lb. seed cotton under the Cotton Bounty Act was extended during the year until the end of 1963. This will assist towards an expansion of the industry, which could become an important feature of the rural economy under a wide range of irrigation and dry-farming conditions.

Assistance was given to the Prices Authorities during the year when the Director served as a representative of this Department on the Prices Advisory Board provided for in the 1957 amendment to the Profiteering Prevention Acts.

The market inspection service suffered a serious loss by the untimely death of the Senior Inspector, Mr. S. C. Todd, in January. Mr. Todd joined this Department in 1919 and during his official career developed a thorough understanding of market procedure. He has been succeeded by Mr. A. J. Crocker, formerly Adviser in Horticulture, Horticulture Branch.

The most notable achievement in the Standards Branch during the year was the progress in seed certification. The quantities of seed of grain sorghum, hybrid maize, tomatoes and French beans certified showed substantial increases over previous years, and in the case of grain sorghum the quantity certified rose from 12,460 bus. during the previous year to 29,476 bus. In addition to this, the first certified buffel grass seed was produced, approximately $1\frac{1}{4}$ tons of Gayndah strain being certified during the year. Bulk handling of certified grain sorghum seed was introduced at Mt. Tyson and proved very successful.

The amount of work performed by the seed testing section showed an increase of 15·3 per cent. in the number of samples tested over that of the previous year despite the fact that the rate of fees was raised at the beginning of the year.

The number of agricultural requirements submitted for registration rose to 2,920, in comparison with 2,649 for the previous year, this being a reflection of the steady advancement being made in agricultural chemistry in recent years.

Because of the need to import stock foods from interstate and overseas sources and the attendant danger of introducing weed seeds and plant and animal diseases, inspectors in the early part of the year concentrated upon the maintenance of stock food standards.

DIVISION OF PLANT INDUSTRY: BRANCH REPORTS.

AGRICULTURE BRANCH.

Mr. W. J. S. Sloan, Director of Agriculture.

The dry conditions of the first half of 1957 continued until early 1958, and production of winter crops in 1957 was well below average. Sowings of the main summer crops were late and below-average acreages of grain crops were sown. A warm autumn and early winter, and adequate soil moisture during this period, resulted in much better yields per acre than had been expected.

Learning to live better with the climate will lead to more stable and efficient production. Queensland's erratic rainfall is a problem with which farmers have to contend constantly. Farmers and agricultural scientists both learn from droughts. On the extent to which those lessons can be applied depends the future of stable agriculture in this State.

Lessons long since learned, but still not adopted as extensively as they should be in this State, include fallowing to build up subsoil moisture for winter and spring cropping, weed control to conserve moisture for crops, and water storage and the efficient use of water supplies from streams and underground resources for irrigation as an insurance against drought. The recent drought has again emphasised the importance of the fullest practicable application of these lessons and has demonstrated all too clearly the penalty to be paid for their neglect.

The growing of forage crops, controlled grazing of pastures, and the use of species which will help to prolong the grazing season or favour quick recovery when the rains come, can play a major part in lessening the depressing effects of dry periods on dairying and livestock production.

Sound property management involving the intelligent choice and application of farming techniques designed to lift production per acre is required if the best farming results which the climate will permit are to be achieved.

But farming techniques alone will not suffice to overcome the problem of droughts for stock-owners. In conservation of stock feed as silage, hay or grain lies the main solution. Storing portion of the production in good seasons for use in dry periods is the only rational way to avoid the disasters of drought.

The 1957 drought has stimulated a wider interest in fodder storage but to ensure more stability in the livestock industries in this State, much more activity along these lines is needed.

Keeping farmers informed of the latest improvements in farming methods and techniques is the main objective of advisory services. It is important, therefore, that research and advisory officers meet regularly to exchange views and discuss the application of research results. For this purpose, several conferences of officers were held during the year.

Two meetings of soil conservation officers were held at Toowoomba. There is no more important aspect of farm management than the conservation of soil. Farmer interest continues to expand with a consequent increased demand for services. Soil conservation staff was increased by five during the year.

The first conference of State officers concerned with pasture investigations was held at "Brian Pastures" Pasture Research Station, Gayndah. Pastures are vital to the success of the State's great stock industries and it is planned to follow up this very successful meeting with others involving officers of the Plant Industry and Animal Industry Divisions.

A seed certification school was held at the Queensland Agricultural High School and College, Lawes, for the training of new officers and to discuss seed certification policy with officers from the main seed-producing areas. Farmers have accepted certified seed wholeheartedly, but operation of the scheme requires much of the time of a number of advisory officers.

Advisory officers from Central Queensland attended a joint conference of the Divisions of Plant Industry, Animal Industry and Dairying which was held at the Biloela Regional Experiment Station. Conferences of

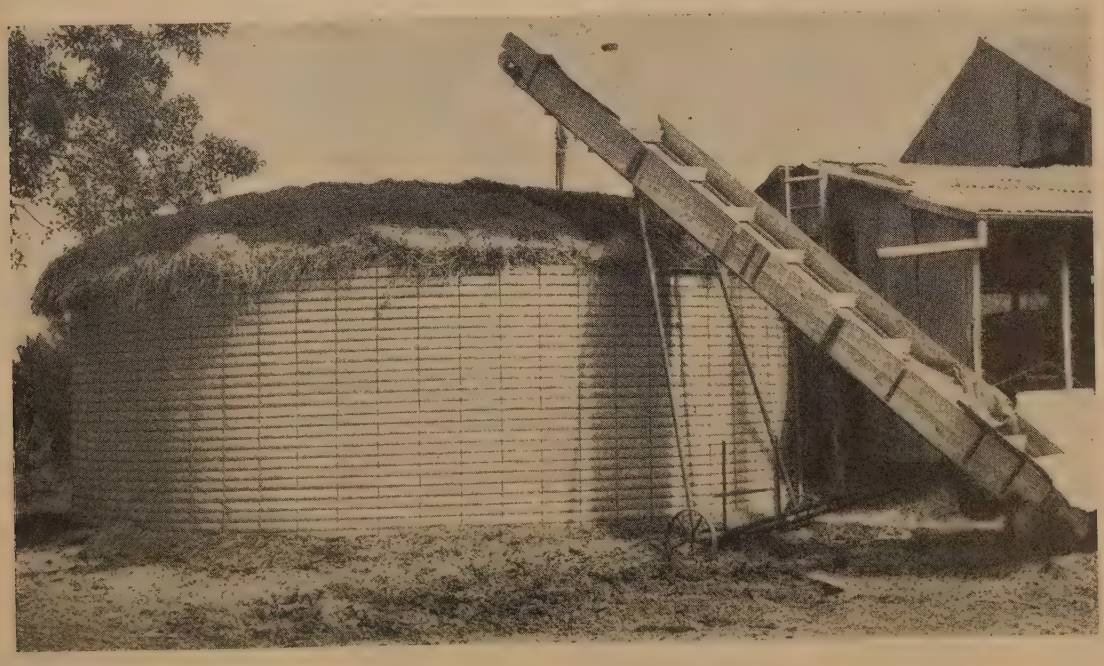


Plate 1.—Silage in Arc-mesh Lined with Treated Hessian.

this type provide a valuable opportunity for officers to inspect and discuss experimental work, and to learn about the practical application of the results from research.

With the removal of severe limitations on travelling of advisory officers, it was possible to resume normal activities to the full extent of available staff. Further emphasis has been given to using methods of communication such as press, radio, field days, schools for farmers, meetings and so on. Results to date indicate that expanding advisory work by these methods and with the co-operation of farmer groups is a valuable way of keeping farmers informed of technical progress in farming.

With the announcement by the Commonwealth Government that a guaranteed price of 14d. per lb. of seed cotton will continue for a period of five years from Jan. 1, 1959, a stimulus has been given to cotton growing in this State.

It is proposed to meet the demand for increased advisory services by appointing two new extension officers and by improving in other ways the flow of information to cotton growers.

Further developmental work was completed on the Tobacco Experiment Stations at Parada and Inglewood.

FIELD CROPS.

The agricultural scene during 1957-58 has not been a bright one, but on the other hand has not been catastrophic. For most agricultural districts, and particularly for the coastal districts, rainfall totals for July-June were not greatly below the annual averages. However, the major contribution to these totals was made during the first half of 1958. Rainfall totals for the calendar year 1957 were in many instances the lowest since 1902, and in some instances only half the district average.

In the main winter cereal districts, good planting rains were received in June-July 1957, but following these there was little effective rain till after the harvest. The effect of this season on the principal crops concerned is discussed in the following sections.

Drought weather continued into December and January, broken only by scattered storms which brought local, but not general, relief. Many summer crops planted on these early to midsummer rains failed through moisture stress but provided useful grazing, hay or ensilage for livestock. Where these rains were better sustained—as in parts of the South Burnett district—an excellent season resulted and yields per acre of peanuts and maize were the highest for many years.

Elsewhere, drought-breaking rains did not occur till late January or early February. The effects of the lateness of the planting rains were to curtail seriously what might well have been a record summer planting and to impose a great risk of frost damage on the crops which were then planted. The mild autumn and early winter conditions of 1958 saved the late-sown summer crop and enabled farmers to extricate themselves from a very precarious position.

Food for livestock was reasonably well maintained throughout the drought in most agricultural districts. This was mainly in the form of crop grazing and of stored grain as supplements to native or improved pastures. Hay, and to a lesser extent silage, also played an important part. As a result, stock losses in the farming areas were less than expected.

Queensland's grain position was serious following the low overall wheat and barley production of 1957. The position would have been really acute had the summer crops of 1957-58 been a failure. The situation has now been restored insofar as the stock-food grains are concerned.

The situation for the 1958 winter season has not been bright, since much of the State's wheat lands did not receive good soaking rains in the late summer or autumn. Conditions were greatly improved by the cyclonic rains of June, but large areas did not enter the winter season with the usual "crop insurance" of stored water. Except therefore in favoured areas, the winter crops will have to depend on a good seasonal rainfall for high yields.

Wheat.

Probably the outstanding feature of the 1957 wheat season was the fact that the crop was produced, to a very large extent, on the rain received during December, 1956. Following the virtual failure of the wet-season period of early 1957, useful planting rains occurred in June-July, but the greater portion of the crop received no effective rain between sowing and harvesting.

In spite of these testing conditions, both yield and quality were remarkably good wherever effective fallowing had been carried out for a period covering the December 1956 rains. The ultimate grain crop was greatly reduced in quantity, largely because of the demands of livestock for grazing or for hay. While the total yield is not expected to exceed 6½ million bus. at the rate of 16 bus. per acre, many crops exceeded 30 bus. per acre. The dry season favoured a high protein content and enhanced the proportion of premium quality grain.

In a State-wide field wheat competition conducted by the Royal Agricultural Society, Toowoomba, in association with the Department and the State Wheat Board, the winning entry produced 47 bus. of grain per acre at a protein level of 14.1 per cent. This achievement in a drought year is an indication of what good farming methods can do in conjunction with fertile soils of high water-holding capacity. It is significant that the winner of this competition (as well as the leaders in recent competitions for the best bushel of wheat) made regular use of lucerne in the cropping rotation.

Two other important features of the season deserve mention. Firstly, wild oats and other weeds were far greater pests of wheat than in recent years. This was largely a reflection of the dry autumn, when there were no early rains to germinate the winter weeds and permit their destruction by cultivation. Effective control of most broad-leaved weeds was possible by hormone spraying. Wild oats, however, is not amenable to such treatment and its prevalence in 1957 could have important carry-over effects in future seasons.

The second important feature was the prevalence of a nutritional disorder, to which further reference is made later.

A good programme of plant breeding work was carried through at the Hermitage Regional Experiment Station, with attention being given particularly to rust resistance, frost resistance, yield and flour quality. Varietal and strain trials carried out in conjunction with this programme again highlighted the performance of some of the Lawrence x Gabo progenies. One of these (LG 5391) again topped the varietal trial yields in the open plains of the Darling Downs; it is now being increased with a view to naming and release as a new variety.

Other new material undergoing increase prior to general release includes (1) a stem-rust-resistant Puora derived by the back-cross method, and (2) a white-grained dual-purpose type which is intended to supplant the unnamed red-grained crossbred K41 PF-4473, which has been widely used for grain production and grazing.

The nitrogen fertilizer work in the Pampas district was advanced a stage. This area has in recent years consistently produced low-protein wheat on old cultivations. A trial of time and application of urea in the past season gave results which were generally comparable with those of the previous year. Moreover, the bulk wheat sown over the area of the previous year's trial showed marked differences in colour and yield. When these plots were harvested they showed a very significant residual effect from the urea applied to the preceding crop. The effects were of the same pattern as those provided by freshly applied urea but were not of the same magnitude. Briefly, the results of the three trials harvested to date (two original and one carry-over) were:—

(1) Increasing rates of urea, up to 2 cwt. per acre, gave increases in yield and protein content of the grain and reductions in the percentage of mottled grain.

(2) The increases in yield were greatest from applications made at the time of planting, and progressively less from applications at tillering, shotblade and flowering stages.

(3) The greatest increases in protein percentage (and decreases in mottling percentage) were from applications made at the later stages of growth.

The economics of these treatments will be investigated at the conclusion of the experimental series. Whether or not the most effective treatments do prove economic, the source of the trouble in this area has been clearly indicated. In addition, useful information on the mode of action of urea when applied at different stages of growth has been obtained.

Other Winter Crops.

The 1957 winter season was a disastrous one for linseed, due in part to the dry season but in much larger measure to ineffective control of Heliothis caterpillars and to a widespread nutrient disorder. This nutrient disorder is at present under investigation by the Chemical Laboratory as well as the Agriculture Branch. Symptoms have been reported over a period of many years. They appear to have been most prominent in the open plains soils and following a fallow of 12 months' or longer duration. In most seasons symptoms tend to disappear with the spring growth flush and mature plants show little sign of having been affected.

During the dry spring weather of 1957 two important differences from the usual pattern occurred: (1) The usual spring flush did not occur, and plants remained stunted and unthrifty throughout the season. (2) Similar symptoms were observed for the first time on wheat, other winter crops and even some summer crops planted in November.

The experiences of the past year have thus considerably altered the focus of attention on this problem. What was previously regarded as a somewhat obscure deficiency disease of linseed now looms as an important nutritional problem throughout open plains country from the Darling Downs to Central Queensland. The possibility arises that this deficiency may have been an important (if undetected) factor restricting cereal yields and tending to nullify the beneficial effects of long fallowing on subsequent crops.

Work on this problem is therefore being given a high priority in the experimental programme for the 1958 season.

In varietal or strain trials of miscellaneous winter crops, the following principal results emerged:—

(1) Of the standard malting barley varieties available in Australia, Prior proved the best under Darling Downs conditions.

(2) In a canary seed strain trial, the locally adapted strain proved higher yielding than any of the imported "mammoth" varieties. Moreover, under dry seasonal conditions, the harvested seed of the latter types was considerably smaller than that of the planting seed.

(3) Reports from a number of centres indicate that Bovah oats is now capable of being fairly severely attacked by crown rust. The only variety available that shows complete resistance to this disease is Saia. While this variety is somewhat too stemmy to be regarded as an ideal grazing oat, proper management does enable it to be effectively grazed and steps are therefore being taken to increase it for general release.

Maize.

Initially, the 1957-58 maize season looked like being well below average in all southern and central districts, and about average on the Atherton Tableland. However, while the late commencement of the season resulted in a considerable reduction in acreage, it did not seriously affect production per acre, since the delayed onset of winter largely nullified the effects of the late planting.

Hybrids are now almost universally accepted in all major maize districts of the State, with the exception of the Atherton Tableland. Even in the Callide Valley, which has been for 20 years a stronghold of grain sorghum, the use of hybrids has enabled maize to make considerable headway.

On the Atherton Tableland proper, hybrids from Queensland and northern New South Wales have shown a definite capacity to outyield the local varieties where fertility is high and disease incidence is low. Under conditions of maize monoculture, however, cob rots take a heavy toll and the hybrids generally prove more disease-susceptible than the local strains. A concerted attack on this problem is being made by trying all available foundation stocks from the hybrid breeding programmes in both Queensland and New South Wales. There will soon be included in the Queensland foundation stock some hybrids based on inbred lines from original Atherton Tableland stocks. It is on this material that greatest hopes for varietal improvement for this environment are based.

As recorded in last year's report, a number of trials were laid down in the 1956-57 season to test the new Q23 hybrid (based on male-sterile lines) against the old Q23 (produced in the field by detasselling the "female" rows). In all instances the former slightly outyielded the latter, corroborating results obtained by the plant breeding staff at the Queensland Agricultural High School and College. This important result means that no deterioration in yield need be expected by substituting the new Q23 for the old. As a result, all Q23 crossing plots established in the 1957-58 season (aggregating over 90 acres) were based on the male-sterile form of the female parent, thus obviating the necessity for the expensive and laborious detasselling process.

Plate 2.—Male-sterile Form of the Female Parent of Q23 Hybrid Maize in a Crossing Plot at Cooroy.

Sorghum and Sudan Grass.

Early-planted (October-November) crops of the sorghum group were generally doomed to failure because the preceding period of drought had not enabled moisture to be conserved prior to planting. Where a long fallow (12 months or more) ensured the safety of the crop, harvesting difficulties were caused by the development of secondary and tertiary heads. This problem of protracted maturity periods was particularly serious in some crops grown for seed certification.

The late-planted crop, as with maize, fared well and promised very satisfactory yields. Expectations were considerably reduced in some districts by the activity of sorghum midge, but in general, yields are considerably better than could have been forecast at the commencement of the season.

For grain sorghum the main features of the season were:—

(1) The enhanced value of the stubbles for grazing by stock due to the absence of early killing frosts.

(2) The excellent record of Alpha from the viewpoint of grain yield and ratooning capacity (the latter particularly in central Queensland).

(3) The benefits of low planting rates in a dry season, particularly in districts such as Wandoan-Taroom and the Central Highlands.

The introduction of certain male-sterile lines from the United States has enabled the Department to commence a hybrid sorghum breeding project. The principal object of this programme will be to develop hybrids capable of out-yielding the present commercial varieties such as Alpha, Wheatland, Martin, Early Kalo and Caprock. This task may not be easy, but overseas experience suggests that the development of suitable hybrids should boost yields per acre by up to 20 per cent. and thus appreciably reduce the cost of production.

In Sudan grass, the Sweet Sudan strain developed by the Department is now in greatest demand. Reasons given for its ever-increasing popularity are (1) greater leafiness, (2) better succulence and palatability, (3) less waste in grazing, and (4) the lowered risk of introduction of Johnson grass, due to the highly distinctive seed coloration of the Sweet Sudan.

Tobacco.

The acreage of tobacco has continued to increase steadily since 1948-49 (apart from a slight decrease in the 1952-1954 period) and reached a record figure of approximately 7,800 acres for 1957 plantings. This is an increase of 1,000 acres on the 1956-57 crop and, as increased yields are certain, the State return for the 1957-58 crop should be a record.

Plate 3.—Furrow Irrigation of Tobacco on the Burdekin, Using Plastic Siphon Tubes.

It has been shown that new selections of Hicks and Virginia Gold are superior under certain conditions to those now grown here commercially. Seed of an improved strain of Virginia Gold will be available for 1958 planting, and seed-increase plots of the Hicks selection will be established immediately.

A fertilizer trial conducted on the lighter tobacco soils in the Bundaberg district proved that good yields and grades could be obtained with 800–900 lb. per acre of tobacco mixtures ranging from 1.5: 15:10 to 1.5: 13:13.

Doubling or trebling the nitrogen applied per acre gave later maturity but in this case did not affect the ultimate return per acre. In a bad blue mould year the delayed ripening could result in a considerable loss to the grower.

Lucerne.

Prices of £30–40 per ton for lucerne chaff during the drought period caused this crop to get favoured attention where irrigation water supplies were limited. On a net return per acre basis lucerne compared more than favourably with potatoes and onions, the main crops grown in rotation with it.

During the past year lucerne gave an outstanding performance as a grazing crop. Over a wide range of climatic and soil environments it was credited with saving many stock during the drought. Light stands obtained from low seeding rates of 1–2 lb. of seed to the acre again proved most suitable for the 20–30 in. rainfall belt.

The acreage in the Moreton district has increased to approximately 8,000 acres with recent plantings of about 5,000 acres. Increased plantings of lucerne are also reported from other districts.

Cotton.

The yield in the 1956-57 season was 2,845 bales of lint from an area of 8,726 acres. Average production per acre harvested amounted to 391 lb. of seed cotton. The lint percentage of 39.27 is the highest on record, exceeding the previous record of 38.29 obtained in 1954-55 season. Quality was good, 90 per cent. of the crop being sold as spinning cotton and the balance as cordage or bedding. This reflects the favourable conditions experienced during harvesting and the efficiency of the new equipment now installed in the ginneries.

Although approximately 17,000 acres were planted for 1957-58, it is estimated that only about half this area will be harvested.

Small acreages of cotton have been grown in the St. George and Gibber Gunyah Irrigation Areas. Although planting was rather late (December) yields have been generally good for late-sown crops, being about 1,000 lb. of seed cotton per acre.

An interesting experiment in bulk handling of cotton, involving long road haulage, has been made in the Banana district. As lower grades in machine-harvested cotton are frequently due to excessive moisture, bulk delivery of such seed cotton should offer considerable advantages over delivery in tightly packed bales. The farmer in question has his own harvester and a diesel truck which is capable of transporting 8 tons per load from the farm to Glenmore ginnery. It is tentatively claimed that the higher grades received plus the avoidance of additional labour for baling will warrant the capital outlay and running charges for the truck. The economics of this method of delivery are being closely watched by other central Queensland growers.

Potatoes.

Costs of production for the spring crop were higher than usual, owing to dry seasonal conditions which necessitated regular irrigation. Market prices were lower than usual (£12–25 per ton), and with slightly reduced yields of 3½–6 tons per acre, farmers' net returns per acre were low. Total acreage for the year remained at about the usual figure of 4,000 acres. Potato tuber moth was again troublesome, the position being aggravated by inability to irrigate adequately, thus permitting the heavy soils to crack and expose tubers.

No commercial variety is yet available to replace Sebago, which occupies about 80 per cent. of the plantings. Sequoia and Exton comprise most of the remaining area.

Onions.

Following the high returns per acre received for the 1956 crop, the area planted to the 1957 crop was increased by about 800 acres to a total of approximately 2,800 acres. Generally yields were higher than usual, approaching 8 tons per acre. Market prices, however, dropped early in the season to about £10 per ton, and many later-maturing crops were ploughed in.

Crops grown without irrigation on the Darling Downs and in the South Burnett generally failed due to lack of adequate soil moisture. Many of the growers in these areas were attracted to the industry by the high returns obtained from the 1956 crop. Plantings for the 1958 crop are not expected to exceed 2,000 acres, and practically all of this area will be in the Lockyer Valley under irrigation.

Peanuts.

A late planting (January-February) of the main crop, together with a mild autumn which allowed the plants to mature, were two features of the season's peanut crop. Approximately 30,000 acres were sown, including about 20,000 acres in the South Burnett and about 7,500 acres in North Queensland. The North Queensland acreage was approximately double that of the previous season. Harvesting conditions and yields were excellent in the South Burnett, but wet weather caused some losses in North Queensland.

The practice of sun-drying in windrows followed by pick-up threshing is still increasing in the South Burnett. A peanut stooking machine designed and developed in the 1957 season is effective but has not yet become

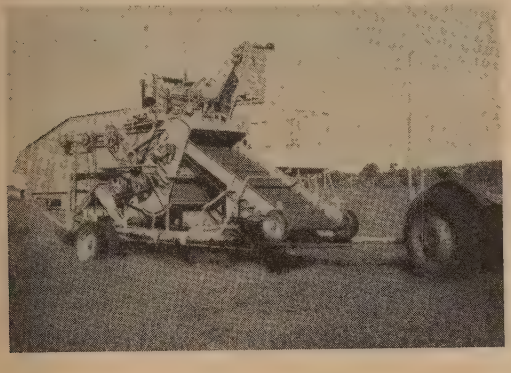


Plate 4.—A Pick-up Peanut Harvester in the Transport Position.

popular. Both these practices of sun-drying and mechanical stooking reduce the demand for casual labour, which is difficult to obtain and costly.

Eight drying units were in use during the past season on the Atherton Tableland, where wet weather again caused harvesting losses. Investigations of the factors involved in the artificial drying of peanuts were continued in co-operation with the Commonwealth Department of Primary Industry and the Peanut Marketing Board. These studies should determine the conditions under which peanuts can be artificially dried without loss of quality or viability.

Weed Control and Weedicides.

The use of chemical weedicides has an important supplementary role to play in weed control programmes and recent results using some of these substances are briefly reported here.

For some time growers have used DNOC successfully to control weeds in onions. Departmental trials have indicated that CMU and potassium cyanate also give satisfactory weed control and these chemicals are now in commercial use.

Pre-emergence weed control has been studied in peanuts and maize in the Kingaroy district and satisfactory weed control for 3-4 weeks after germination has been obtained with both crops by using 2,4-D at 1 lb. acid equivalent per acre.

The tolerance of peanuts, grain sorghum and wheat at various stages of growth to hormone weedicides has also been studied on the Darling Downs and in the Kingaroy district. Most effective weed control is obtained, and less damage to the crop by spraying machinery occurs, at the crop seedling stage. On the other hand, the crops themselves are more susceptible to damage by hormones at this stage.

By using lower rates of application, satisfactory weed control can be achieved without significantly reducing yields. The available information suggests rates no greater than ½ lb. acid equivalent per acre for grain sorghum 3 in. high, and rates not greater than ¼ lb. acid equivalent per acre for peanuts two months old or wheat 6 in. high. In the cases of peanuts and grain sorghum, MCPA at equivalent concentrations is more selective than the sodium salt or amine of 2,4-D.

These studies are continuing and other important crops will be included later.

Plate 5.—Effect of 2,4-D Applied to Grain Sorghum for Weed Control at the Flowering Stage.

PASTURES.

By June, 1958, the only area in the State where pastures had not been revived by rains was the extreme south-western portion. Valuable lessons have been learned from the behaviour of both native and sown pastures under adverse conditions.

In the main, confidence in sown pastures has been strengthened by the manner in which sown pasture species survived the drought and made very rapid growth when rains came. The selection of the correct pasture species to use for any particular set of conditions has been shown to be very important. There remain, however, large areas of pastoral country for which agrostologists cannot recommend any species economically more suitable than the existing native grasses. The problems of efficient utilisation of native pastures is all-important under these circumstances.

Primary producers and firms with interests in the primary industries continued to show active interest in pasture improvement. Specialists and field officers of the Branch attended a number of field days, field excursions and special schools on pastures. Two schools, one for dairy-farmers and one for cattle raisers, were arranged by the Department at the South Johnstone Experiment Station; a dairy-farmers' school was organised at Gympie by Nestles Food Specialities (Aust.) Ltd. in co-operation with the Department.

Drought affected the number of entries in the fourth pasture improvement competition sponsored by the Royal National Agricultural and Industrial Association with the assistance of Departmental officers. A total of 75 entries was received, compared with 102 in the previous year; a number of withdrawals due to drought occurred during the year.

Financial assistance in the carrying out of pasture research projects was again received from the Australian Dairy Produce Board and Shell Chemical

(Aust.) Pty. Ltd., and funds were made available from the Wool Research Trust Fund for pasture work in wool producing districts.

There are 133 pasture experiment plots located throughout the State under the control of the Agriculture Branch and in addition 33 demonstrations are in operation under the terms of the Commonwealth Extension Services Grant. Branch officers also act as consultants and advisers in the pasture demonstrations being conducted with funds from the Commonwealth Dairy Industry Extension Grant.

Pasture Species.

Three hundred new introductions of grasses and legumes were received during the year and distributed to Experiment Stations and district officers for regional testing under quarantine conditions.

Preliminary genetical studies of a number of strains of Queensland blue grass (*Dichanthium sericeum*) have confirmed the opinion that wide variations occur within this species. Arrangements have been made to test four of the outstanding strains under widely differing soil and climatic conditions.

An outstanding result during 1957-58 was the capacity shown by buffel grass, green panic and lucerne to withstand prolonged dry periods and to make rapid regrowth after rain. In areas where these three species and Rhodes grass occur, the last suffered most severely but in many districts showed good recovery by June, 1958. These three grasses and lucerne were the main species sown in rain-grown pastures in Queensland in 1958.

In environments to which they are suited, phalaris, scrobic, molasses grass, barrel medic, burr medic, subterranean clovers and phasey bean demonstrated a capacity to provide longer grazing than native pastures and to regenerate either from roots or in the case of the annual species from self-sown seed.

The use of centro and Townsville lucerne is increasing in the coastal regions of central and southern Queensland. New plantings with these legumes and stylo made since the breaking of the drought indicate that much of the poorer country in coastal Queensland now under blady grass and the poorer native grasses could be developed under improved pastures.

Pasture Seed Production.

Townsville lucerne is still the only tropical legume harvested in Queensland on a commercial scale and the development of satisfactory seed-harvesting techniques for centro and stylo is still needed to enable Queensland farmers to obtain adequate supplies of seed of these two legumes.

Seed of Queensland-grown grasses was in short supply for most of the year owing to the drought, but very large amounts of buffel grass, green panic and Rhodes grass seed were harvested during March-May, 1958.

The development of simple buffel grass seed-harvesting machines has resulted in increased amounts being collected at relatively cheap rates. Results from south-western and north-western Queensland indicate that this grass may be machine-harvested for less than 1s. 6d. per lb.

Fertilizer Trials.

Fertilizer trials continued to indicate the need for superphosphate and, in some cases, lime on much of the coastal dairying country. The value of these two materials has, in all trials so far conducted, overshadowed any results being obtained from potash or trace elements.

The results of trials carried out at Cooroy on a yellow clay loam and at Carbrook on a podzolised light sandy soil with complete fertilizers, summarised in Table 1, illustrate the importance of phosphorus and calcium in promoting growth of red and white clovers.

Spectacular responses were obtained when gypsum was applied to irrigated lucerne, red clover and phalaris at Deuchar in the Warwick district. On this alluvial dark-grey clay loam, untreated plots yielded 1,875 lb. green matter per acre in June, while plots receiving 1 cwt. gypsum per acre in April yielded 6,250 lb. green matter in June.

The study of the phosphate requirements of buffel grass in central and western Queensland was continued.

Pasture Establishment.

The efficient establishment of pastures remains an important factor in pasture improvement work. An intensive investigation of the factors responsible for unsatisfactory germination and establishment of sown pastures on the heavy soils of the Darling Downs has been commenced. This work is of importance if cereal growers in the area are to have an opportunity to introduce pastures into the land-use programme.

Success has been achieved in the initial work of establishing sown summer pastures on the poor sandy soils of parts of the Burnett Valley. In this area precropping to vigorous fodder crops of cowpeas and panicum not only provides highly nutritious feed for stock but builds up soil fertility to a stage where sown pastures establish readily. In some localities, superphosphate may also be required.

The success of sown pastures in the lightly stocked pastoral areas of the State will depend on the ability of new species to spread from small strips into existing native grassland. Even where planting costs can be reduced to as low as 7s. 6d. per acre planted, it will still be necessary from an economic point of view to sow in strips. A large-scale trial to measure the rate of spread of buffel grass in the Cloncurry district when the grass is planted in strips 2 yd. wide and 20 yd. apart was commenced.

Aerial sowing of grass seeds remains a most useful method of establishment in cleared and burnt scrublands, where the ashes from the burn provide a suitable seedbed. A total area of 35,000 acres was sown from the air in the Callide and Dawson Valleys.

"Brian Pastures" Pasture Research Station.

Molasses grass, paspalum, scrobic, Rhodes grass and temperate grasses failed during the dry weather, but the performance of buffel, green panic, lucerne and *Glycine javanica* was most satisfactory.

A stocking rate of one weaner steer to 2½ acres was maintained throughout the drought on rotationally grazed pastures composed of lucerne with either Rhodes grass, green panic, or buffel grass. No stock died, and the liveweight gain per acre was superior to that from native pastures grazed at half the stocking intensity. The balance of pasture components changed radically in the year. The contribution of lucerne and the intrusion of native species increased in the Rhodes grass sward, and declined in the buffel and green panic.

A management trial on native pasture was commenced in January 1958. In the first three months stock gained at the rate of 2.5 lb. per day, and liveweight gains slightly favoured the control (open grazing) and chisel renovation treatments. The latter treatment promoted an increase in native legumes and forbs. Late-summer mowing provided accessible green leaf later into the autumn period.

Extensive methods of pasture establishment involving a burn and single cultivation at sowing were again unsuccessful. Satisfactory emergence of lucerne, phasey bean and exotic grasses was achieved, but subsequent growth and survival were poor. Further trials are in progress, examining methods of seedbed preparation, variation in time of sowing, and the effect of two fodder cropping systems on subsequent pasture establishment.

Work designed to provide basic information on the growth and development of pasture grasses was commenced. In one experiment, seasonal changes in the dry matter and reserve carbohydrate levels of the root, stem, leaf and inflorescence fractions of green panic and buffel grasses are being measured. At the autumn harvests, Gayndah buffel showed consistently higher yields of leaf blade and of roots. Another experiment has concentrated attention on the seedling growth of roots and shoots in several grass strains.

Irrigated Pasture.

The shortage of rain-grown pastures and fodder crops resulted in overgrazing of many irrigated pastures. As a result of this and insufficient irrigation, deterioration in composition and growth cover occurred in a number of fields.

Where irrigation practice was good, excellent production was maintained. Moreover, fields which were

not regularly irrigated and not overgrazed during mid-summer recovered very well in the autumn. Replanting of pastures was necessary where irrigation was not possible during stress conditions.

Plate 6.—Sheep Grazing on an Irrigated Pasture Composed of White Clover, Cocksfoot, Phalaris and H1 Ryegrass.

Heavy invasion of irrigated pastures by paspalum was noted. While this is causing concern to some farmers, experience suggests that a well-managed irrigated paspalum-white clover pasture can give good year-round production under coastal conditions.

Reed canary grass (*Phalaris arundinacea*) again demonstrated its ability to give high summer production, and a mixture of this grass with white clover could also prove suitable for coastal conditions. Priebe perennial prairie grass has shown definite promise as a component of irrigated pastures.

Increased pasture plantings were made in the Murgon, Goomeri, Nanango and Central Burnett districts, where approximatelly 400 acres of new pastures were sown ; of this area over 200 acres will be border irrigated. Additional plantings have also been made in the Beaudesert, Brisbane Valley, Callide Valley and coastal areas.

The development of underground water supplies for irrigation has been stimulated by the depletion of surface water and by restrictions on pumping from streams imposed during the drought.

Further bores were sunk in the Beaudesert, Brisbane Valley, Callide Valley and Cecil Plains districts. In the Lockyer Valley, bores are also being developed on farms where stored water in the Lockyer Creek is available. Interest was shown in farm dam storage, mainly in the Gympie district, for supplementary irrigation of small areas of pasture and lucerne to aid dairy production.

In the Maleny districts, with an average rainfall of 80 in., several farm dams for irrigation have been constructed to offset decline of the existing kikuyu and paspalum pastures during dry periods.

The need for an adequate water supply for the area irrigated was clearly indicated during the recent drought. Areas planted for irrigation must be kept within the limits of the available water supplies, otherwise failure of portion or perhaps the whole of the area is inevitable when water supplies are exhausted in a long dry period.

Use of water of high salt content, chiefly from tidal streams, severely depressed pasture growth. Salt-tolerant species such as lucerne, Rhodes grass and kikuyu persisted well in contrast to paspalum, which showed salt burn.

Experimental plantings of pastures were also made during the year at the Parada Tobacco Experiment Station, Mareeba, tropical, subtropical and temperate species being sown. These were planted in a poor sandy loam soil. Border irrigation was used, but water penetration was poor and in an endeavour to give effective watering, 4 acre-feet of water was applied. Heavy fertilizing with a complete mixture was necessary.

Promising results were obtained from some of the tropical species, notably centro, para grass and guinea grass. Although the temperate species were planted at a later date, these have shown their ability to produce attractive feed.

SOIL CONSERVATION.

Farmers continuel to show much interest in soil conservation. A total of 1,270 requested advice during the the year; of these 420 had not undertaken soil conservation work previously.

Advisory officers were able to attend to most of these requests and, as part of the free Departmental services, developed farm conservation plans and marked out sites for contour banks, waterways and other structures necessary to bring surplus run-off water under control.

A grand total of 1,668 farmers is now applying conservation measures. Protective earthworks have been installed on 56,000 acres of cultivated lands on their farms. Of this total, 25,000 acres have been treated in the past two years, compared with 31,000 acres in the previous eight years. Run-off interception and disposal structures were installed on 13,000 acres of agricultural land in 1957-58.

Soil Erosion.

Drought-breaking rains occurred as hit-and-run storms, which were of unusually high intensity in most districts.

Serious soil losses were recorded in the South Burnett district, but on the Darling Downs the losses were lower than usual. However, one farm near Dalby lost practically all the soil to plough depth from cultivated paddocks. The soil lost covered an adjacent 200 yd. section of gravel road with silt to a depth of 18 in.

Erosion losses were particulary severe during the early drought-breaking storms because the soils were dry and dusty and without protection from plant growth. As the season advanced, rapid growth of pastures, crops and weeds provided a protective cover and soil losses decreased.

Many of the storms reached an intensity of 5-6 in. per hour for periods of 15–20 min., and intensities of 4 in. per hour for periods up to 30 min. were quite common. In the Murgon district, one storm yielded 8½ in. of rain in three hours.

Soil conservation structures are designed to cope with defined maximum rainfall intensities. These maxima were reached more frequently in the first half of 1958 than in any similar period during the past 10 years. The structures received severe tests, particularly in the South Burnett, but performance was satisfactory. Complete protection was provided on numerous areas which had been seriously eroded prior to treatment.

Conservation Farming.

One point emerging from the year's observations is the danger of relying too much on agronomic measures alone for protection under climatic conditions which prevent their effective application. Stubble-mulching and cover-cropping procedures are very effective in improving infiltration and in reducing run-off and soil losses, but as shown in 1957-58, seasonal conditions may not be good enough to grow a cover crop or the crop which is to provide the necessary stubble.

Even pasture lands were denuded of their top growth. In some districts, the pasture areas were almost as susceptible to erosion as the cultivated lands.

In rural areas, there is a slow but continuing trend towards improved land use practices. The burning of crop residues is becoming less prevalent as more farmers recognise their soil protection value. They are also more aware of the need to avoid fine dusty fallows and the value of tined implements in this regard.

There has been no marked expansion in the use of the pasture phase in crop rotation programmes on farmlands. The efficient establishment of pastures on the clay soils of the Darling Downs is a problem which has not yet been solved. Economic use of the pasture is also an important factor.

Farmers are reluctant to change to dairy-farming, but sheep and fat lamb raising appears to be increasing in popularity. This is noticeable in the South Burnett district, where some farmers are utilising sheep to stabilise their farm economy. If interest in this aspect of animal husbandry is maintained and expanded, it may provide the incentive for the establishment of a pasture phase in the rotations.

The cheapest and most effective solution to the Darling Downs plains flooding and erosion problems might lie in an orderly approach to land utilisation by which costly drainage schemes are avoided. Such an approach involves the establishment of alternating

bands of crop and fallow land set at right angles to the direction of flood waters. The cropping programme is designed to ensure that winter and summer crops are grown on alternate strips so that at no time will the whole area be in a state of bare fallow and thus completely exposed to erosive influences.

For observation purposes, a strip cropping project was established during the year on 400 acres of flood-swept farmland on the Darling Downs plains. So far the results have been encouraging. Strips of grain sorghum served to retard and spread flood flows, reduce velocity and mitigate soil movement.

In the Central Highlands, a large number of new settlers showed interest in preventing erosion. Some property surveys have been made, thus enabling the delineation of water disposal systems, general farm planning and the surveying of contour lines for strip-cropping projects. Conservation plans for 12,000 acres were developed and 9 miles of guide lines were surveyed.

The problems of grass species for the stabilisation of waterways have in general been resolved. Kikuyu grass is proving by far the best for the Eastern and Northern Darling Downs. African star grass is giving promising results on the low-gradient waterways of the Central and Western Downs and is also proving to be the best coloniser in the Atherton and South Burnett districts.

Demonstrations of mechanical planting of kikuyu grass have continued on the Darling Downs and 63 waterways were planted with the Bermuda sprig planter during the year.

Run-off and Erosion Control Work.

The control of run-off is still the major problem in farming districts. The main difficulty has been to co-ordinate water disposal systems so that run-off waters can be directed through numerous farms and across roads to the main watercourses without causing damage.

In order to deal effectively with this problem advisory officers concentrated on group planning in the second half of the year. Local authorities and the farming community have shown a very definite preference for this type of approach. Group planning is based on a mapping system which enables plans to be developed in units of 5,000 acres. Integration of these units has been assured by the establishment of a grid pattern for the whole of the Darling Downs and the South Burnett. There are approximately 1,000 of these 5,000-acre grid units requiring early planning. Each grid requires about 30 technical man-days.

Steps were taken during the year to free experienced advisory officers from routine surveying duties so that they could concentrate on group planning activities. A number of surveying officers were appointed to the Darling Downs and South Burnett districts. These officers are carrying out the surveying work for location of earthworks and assist planning officers in obtaining basic information on land conformation.

Over 30 grid base plans have been prepared on a 10 chain to 1 inch scale and planning officers are proceeding to design run-off and erosion control structures on these base plans. As the grid unit conservation plans are completed, they are amalgamated to form catchment plans.

Twenty-one catchment areas totalling 120,000 acres are currently being planned. When completed, the plans will be referred to the landholders, who will determine the method of implementation. Three catchment plans with a total area of 11,000 acres were completed during the year.

Very satisfactory progress was made during the year in the installation on farms of run-off and erosion control structures. On the Darling Downs, an area of 6,760 acres of farm land has been protected and in the Burnett zone an area of 5,200 acres.

Although an increasing number of farmers are attaching dozer blades to their tractors, earthmoving contractors continue to play an important role in the application of soil conservation schemes. Eight contractors are engaged almost full-time on this work in the South Burnett and Darling Downs areas and, in general, are executing work of a high standard at a satisfactory price.

Group Action.

Farmers in the South Burnett district have followed the Department's lead in group planning by organising voluntary farmers' soil conservation groups to assist in the resolution of mutual problems, to provide a liaison with extension officers and to facilitate action programmes.

During the year, three soil conservation groups were formed; these represent the interests of landholders in 11 catchments with an aggregate area of over 50,000 acres. The executive for each group comprises three representatives from each catchment area. The Wooroolin-Memerambi group has already been successful in resolving difficulties relating to co-operative action in one of its catchment areas.

Extension Activities.

A total of 2,118 farm visits was made by extension officers during the year for the purpose of preparing farm plans and for the survey of sites for earthworks.

Mass media have been utilised to stimulate interest and to outline the broad principles. During the year under review, 45 radio talks were given and 40 press articles released. Seven show displays were prepared and 37 lectures delivered. Twenty-three field days and schools were conducted and 7 conducted tours were arranged and attended. Two articles were prepared for the *Queensland Agricultural Journal*.

Investigations.

Most of the investigatory work was confined to the Atherton district but the hydraulic observations there are generally applicable to other areas of the State. Very satisfactory results were obtained in the waterway stabilisation trials which were initiated to determine economic methods of stabilising gullies on the sites of red soil waterways.

One method used included grading to the desired section and protection with mulch and netting spreader strips; the other involved the use of compacted earth weirs. African star grass was planted in both treatments. Major flows were carried in the waterway without damage and the grass is colonising well. The earth weir showed most promise and has the advantage of cheapness and economical use of filling material.

A number of hydraulic observations were made on established waterways using pitot tubes to determine velocities. This enabled the calculation of roughness coefficients for a number of different waterway surfaces. These have provided a good check on the validity of design methods.

In the waterway vegetation investigations, African star grass is outstanding in colonising ability and on forest soil waterways appears to be the only grass capable of colonising within a reasonable time. On scrub soils, the other grasses tried—kikuyu, couch and African couch—are satisfactory though slower than African star grass.

Run-off measurements were continued at the Kairi Regional Experiment Station. As in the previous year, run-off was highest from the maize borders and least from the green panic-lucerne border.

AGRICULTURAL MACHINERY.

Drought intensified the demand for water reticulation and irrigation equipment.

A demand for a reasonably priced forage harvester is being met by the introduction of the flail type forage harvester which has low maintenance costs and the capacity to handle tall fodder crops such as maize and sorghum. A reduction in the capital cost of these machines is anticipated as a result of greater competition between Australian manufacturers producing such equipment.

Previous demonstrations with the Bermuda sprig planter indicated the suitability of this machine for grassing waterways on farms. The demand for a machine to do this type of work is widespread. Since waterway areas on each farm are relatively small, attention is being given to interesting shire councils and contractors in this type of activity. Modifications to the design of this machine are being embodied in a new machine to be built at Toowoomba in co-operation with the Commonwealth Department of Primary Industry.

There was a slight increase in the number of farm-size driers in operation for drying ear and seed corn. Drying installations for barn curing of loose and baled hay also attracted attention. The introduction of mobile low and medium temperature drier units independent of electric power for their operation is expected to accelerate this interest.

In common with other States, greater use is being made of aircraft to dust and spray for pest and disease control and for topdressing and sowing grasses in areas inaccessible to ground-operated equipment. The estimated area of 144,175 acres treated from the air during 1956-57 was 26.7 per cent. greater than the acreage treated during 1955-56.

SOUTH JOHNSTONE EXPERIMENT STATION.

The rainfall of 137 in. (16 in. above average) was almost equal to that for the previous year, but nevertheless it was not a good year for pastures and crops. After a June record fall of nearly 20 in., only 12 in. fell in six months, the total for August to October being 1.77 in. on 16 wet days. Very heavy rain fell after December, 1957, and since then, except for a very wet April, with nearly 28 in., the weather has favoured pastures and other tropical crops.

Pastures.

The guinea grass, para grass and centro pasture trial has been established but species distribution is still variable. Five of the 2-acre fields, amalgamated for continuous grazing, carry reasonably uniform pasture. The other five-acre fields for rotational grazing are so variable that, although they have been grazed, comparative productivity measurements have not begun.

The continuous grazing trial at Utchee Creek was maintained. Observations confirm guinea grass and centro as the best pasture for such conditions—this mixture provided adequate feed for one steer on 1.34 acres, despite the long dry spell. The areas of other pastures needed to maintain one steer were as follows: para grass and centro 1.73 acres, guinea grass 1.81 acres, guinea and molasses grasses 2.13 acres, para grass and puero 2.35 acres, molasses grass and centro 2.38 acres, and para grass 2.59 acres.

Consolidation of the 32-acre guinea grass and centro pasture at Utchee Creek continued. Fencing and water supply was completed for one 16-acre field under continuous grazing and four 4-acre fields under rotational grazing. Some comparative figures for productivity under the two grazing systems should be available next year.

Other tropical pastures which may be useful include Pangola grass (*Digitaria decumbens*), which is very vigorous but grows like green couch grass and may be just as difficult to control. *Brachiaria decumbens*, which has been under observation for some time, does not appear to be very palatable but is popular locally because of its dense ground cover; it may be useful for suppressing weeds where stock traffic is heavy.

Tea.

The tea hedges and seed gardens suffered severely during the dry hot weather. The worst effects were widespread sunscorch, severe thrips infestation and reduced production. The hedges were planted in three series, in 1952, 1953, and 1954. Only the oldest have been harvested with the Tarpen clipper, yielding 2,600 lb. cured tea per acre, compared with 3,400 lb. per acre in 1956-57. Quality was lower also but both effects can be ascribed to the unusually hot dry weather.

Some 570 trees are maintained as seed gardens covering three acres. *Desmodium heterophyllum* has provided good ground cover between the hedges, but stylo failed in the seed gardens and will be replaced.

Miscellaneous.

The infertility of purple-top guinea grass seed received further attention. Covering seedheads by plastic bags soon after emergence increased the number of caryopses formed. Guinea grass responded better to urea nitrogen than to sulphate of ammonia nitrogen, both applied at approximately 50 lb. nitrogen per acre. The museum plots were maintained; new introductions included species of *Paspalum* and *Setaria*.

Dry weather and the use of insecticides combined to encourage improved seed setting by trellised and broadcast puero. Small quantities of rice seed were produced, as in previous years, to maintain nucleus stocks of varieties suited to local conditions.

Among local weeds guava was partially controlled by the use of hormones in distillate as a basal bark treatment. No spray treatment tried was superior to mechanical means for lantana control. Both dalapon and TCA were reasonably effective against giant guinea grass and green couch grass provided application was not followed by heavy rain.

The station was used for one Field Day and two 3-day Schools during the year. All were well attended.

TOBACCO EXPERIMENT STATIONS.

Parada.

The building programme was maintained and the manager's residence, a bulk shed-curing barn unit and two cottages were completed. Irrigation water has been obtained by permanent underground pipe-line from the Walsh River and by open earth channel from the South Walsh main. Electricity has been connected to all buildings and a telephone installed.

Twelve acres of Walsh fine sandy clay loam (levee) are now cleared, ploughed and fenced, and 12 acres of Mutchilba sandy loam have also been cleared.

Results from a varietal trial were partly masked by blue mould stem infection. Grade values showed that the local selections from Hicks were best, but Virginia Gold ex Eldorado also gave a good performance.

Peatmoss and perlite improved the water-holding capacity of sandy seedbed soils so much that watering could be restricted to every second day.

Of crops which may assist in maintaining tobacco soil productivity, cotton, soybeans and navy beans grew well on the levee soils. Germination of seed of green panic and Rhodes grasses proved to be unreliable on this soil type.

Facilities were provided for tobacco disease control experiments, results of which are contained in the annual report of the Plant Pathology Section, Science Branch.

Inglewood.

The manager's residence was occupied by the newly appointed Officer-in-Charge in April, 1958. Three new tobacco barns were erected in time for the curing of all leaf harvested on the property in 1957-58 but only two were equipped and used. The completion of concrete paving around the barns and bulk shed will enable vehicles to be used in the vicinity under all weather conditions.

The water supply was improved and a meteorological station was completed. A telephone was installed and arrangements are well in hand for supplying 240V A.C. current to all houses and farm buildings.

An area of 2½ acres of experimental tobacco, including rotation, varietal and chlorine uptake trials, was grown during the season. A trial superimposed on the chlorine uptake area was used to study the time of application effects of EDB.

Crops planted for rotational purposes included oats, wheat, grain sorghum, cotton and Rhodes grass.

Results will not be available until leaf has been graded and valued.

TABLE 1.

EFFECT OF SUPERPHOSPHATE AND LIME ON CLOVER GROWTH AT COOROY AND CARBROOK AS SHOWN BY A SINGLE HARVEST CLOVER YIELD IN LB. OF GREEN MATERIAL PER ACRE.

Treatment.	Cooroy. (September, 1958 Harvest.)	Carbrook. (October, 1958 Harvest.)
Plots without lime or superphosphate but with potash and trace elements	Not Sampled	1,280
Plots with 4 cwt. superphosphate per acre	2,878	6,911
Plots with 4 cwt. superphosphate and 10 cwt. lime per acre	6,079	8,313

REGIONAL EXPERIMENT STATIONS BRANCH.

Mr. W. J. Cartmill, Director of Regional Experiment Stations.

The primary function of the Regional Experiment Stations is to obtain data of a fundamental and practical nature relating to soils, crops, pastures and farming practices for the purpose of helping farmers to overcome problems and improve production and to find new avenues of production.

The programme of the Stations is based largely on the concept of permanently improved production by a balanced farming system through the profitable integration of crop and animal husbandry, and some of the most important work is developed on a pattern consistent with this concept.

In a year highlighted by drought conditions, the growth of crops and pastures on the Stations has been generally satisfactory, and this result strikingly demonstrates that proper systems of land management can do much to overcome natural obstacles to production.

Rainfall data for all Stations are given in Table 1.

HERMITAGE.

The year was characterised by abnormally dry weather, and the production of satisfactory crops under such conditions throws emphasis on the importance of moisture conserved in the soil during fallow periods. The rainfall for 1957 at Hermitage (15.54 in.) was the lowest on record. Fortunately, soil moisture reserves had been built up by 8 in. of rain in December 1956, and it was principally this moisture that made crop production possible.

Crops.

Wheat.—Because soil moisture reserves supplied the bulk of the water requirements of the 1957 crop, best yields were obtained from long-fallowed areas where the reserves were highest. Early-maturing varieties fared much better than late-maturing varieties, the former yielding an average of 37.5 bus. per acre, compared with 29.2 for the latter. Such a result was to be expected, since late sowing (in July) and limited soil moisture made the season more suited to the early-maturing varieties. Gabo was the best of the early

TABLE 1.

REGIONAL EXPERIMENT STATIONS. RAINFALL, 1957–58 (INCHES)

Month.	Hermitage.		Biloela.		Ayr.		Millaroo.		Kairi.		Gatton.	
	1957–58.	Mean (10 years).	1957–58.	Mean (35 years).	1957–58.	Mean (9 years).	1957–58.	Mean.	1957–58.	Mean (6 years).	1957–58.	Mean (College 58 years).
July	2·18	1·09	1·22	1·32	0·61	1·59	1·80	No	1·16	0·86	2·28	1·38
August	1·71	1·02	0·71	0·73	0·16	0·44	0·71	past	0·08	1·02	0·45	1·01
September	0·56	1·52	0·00	0·89	0·00	0·29	0·14	records	0·00	0·96	0·36	1·56
October	1·36	3·81	3·23	2·07	0·58	0·85	0·78	avail-	0·07	1·62	2·97	2·51
November	0·15	2·31	2·02	2·89	0·42	1·98	0·78	able	3·52	2·40	0·17	2·82
December	0·58	2·73	0·48	3·55	0·94	1·33	1·09		1·18	3·20	1·29	3·82
January	2·47	4·02	2·49	4·10	4·36	14·74	4·23		11·38	11·08	3·12	4·42
February	1·96	3·11	7·38	4·93	20·25	10·89	13·45		17·59	12·09	7·18	3·82
March	3·37	2·64	2·63	2·80	7·35	8·10	4·20		12·44	10·40	3·66	3·32
April	1·59	1·20	1·86	1·66	3·08	2·81	13·27		5·97	4·04	3·40	2·01
May	0·82	1·36	0·13	1·57	0·32	2·65	0·58		1·62	1·87	0·27	1·63
June	2·25	2·45	4·65	1·67	2·31	1·03	2·09		2·11	1·93	4·82	1·79
Annual Rainfall	19·00	27·26	26·80	28·18	40·38	46·70	43·12		57·12	51·47	29·97	30·09

varieties, with a yield of 40.2 bus. per acre; it was followed by Spica (37.9), Fedweb 5 (37.1), Puora (36.8) and Seafoam (35.8). Of the mid-season and late varieties, Celebration yielded 30.5 bus. per acre, followed by Festival (30.2), Charter (29.4), K$_1$S4604 (28.9) and Lawrence (27.0).

Grain Sorghum.—Grain sorghum, usually one of the main crops on the Station, occupied only a small part of the cropping programme during the 1957-58 season because normal plantings in early summer could not be made on account of the extremely dry conditions. Some plots were late-planted after rains in early February to complete treatments in a rotation trial, but they were sown too late to make satisfactory growth.

Lucerne.—Growth of lucerne on newly-sown areas was retarded by dry conditions. Older established stands grew remarkably well in the drought, apparently drawing on moisture supplies in the deep subsoil.

Other Crops.—Barley (variety Prior), was grown for pig feed and yielded satisfactorily at 33 bus. per acre. Linseed crops were seriously affected by drought conditions and yielded poorly at 3.6 bus. per acre. Oats (Bovah) and safflower (Horowitz) were grown for seed increase purposes. Trials on the harvesting of canary seed with standard harvesting machinery clearly indicated the effect of cylinder speed on threshing efficiency.

Pastures.

Winter-growing pastures of *Phalaris tuberosa*, ryegrasses and prairie grasses made good growth until soil moisture reserves were exhausted, when they rapidly died off. Summer-growing species made practically no growth until after rain in March, and only poor stands of Rhodes grass and green panic have resulted. Where lucerne was a component of pasture mixtures it was the dominant plant species, and in places was the only green material available.

Nursery.—Over 100 species and strains of pasture grasses and legumes are being tested in the nursery. Of the winter growers, *Phalaris tuberosa* has maintained its superiority, though three species of Bromus—*B. inermis*, Blando brome and Priebe perennial prairie—have performed well. Wimmera ryegrass appears to be the best of the ryegrasses. Buffel grass proved itself under the season's dry conditions to be a drought-resistant summer grass.

Rotations.

In the 4-year cash crop rotation (wheat, wheat, long fallow with and without cowpeas as a green manure, followed by grain sorghum), the best yields of wheat followed a long fallow after sorghum (average yield 36.0 bus. per acre). On the other hand, yields were lowest following cowpeas (average 24.2 bus. per acre) in the control plots growing the green manure and wheat annually. These results are correlated with soil moisture reserves.

In the 8-year cash crop and grazing rotation (four years lucerne followed by grain sorghum, wheat, oats for grazing or grain, and wheat) established on deep, fertile, alluvial soil, the highest yield of wheat (36.7 bus. per acre) followed sorghum after a fallow period. Where wheat followed oats after wheat, the yields were much lower (28.4 bus. per acre). Here, too, the yields were correlated with reserves of soil moisture.

A similar 8-year rotation has been established on a shallower soil on gentle slopes. Wheat yields of 28.0 and 25.9 bus. per acre were obtained from plots similarly cropped over the last three years, but prior to that the one that produced the bigger crop had grown lucerne for five years, whereas the other had winter grain crops over the same period. This effect suggests there is still a carry-over effect of lucerne beneficial to yield.

Stock.

The early weaning and nutrition trials with pigs have attracted the attention of local pig farmers, while interest continues to be shown in the circular farrowing pen. The flock of 300 wethers has maintained good condition despite a period when the feed position was difficult due to drought.

GATTON.

The Regional Experiment Station at Gatton was established in January 1957 by the transfer to the Department of the Irrigation Research Station that had formerly been controlled by the Bureau of Investigation of Land and Water Resources. The programme of pasture research already established by the Bureau has been continued, and activities are being expanded to include investigations of other crops under both irrigated and non-irrigated conditions.

Above-average summer maximum temperatures, aggravated by severe drought conditions until mid-January, made conditions very severe for temperate pasture species, but production and persistence nevertheless were kept at a high level by careful attention to irrigation and management. Following rain in mid-January, favourable conditions for pasture growth prevailed and they continued through the autumn.

Irrigated Pastures.

Establishment Trials.—Some growers of irrigated pastures have found difficulty in maintaining grass species for more than one year when these are sown with white clover, and an alternative method of sowing the grass species alone and sod-seeding the white clover at a later stage has been suggested. Trials of these two methods, utilising a mixture of *Phalaris tuberosa*, H1 ryegrass, cocksfoot and white clover, have clearly established that a better pasture is finally obtained by sowing the clover and grasses together; moreover, this method of establishment has the advantage of providing much more grazing in the first two years. In approximately 18 months it produced 63 tons of pasture, as against only 23 tons by the alternative method.

Sod-seeding Trials.—Trials over a period of two years aimed at introducing various grass species into established white clover stands have demonstrated that good results are obtainable by sod-seeding H1 and Italian ryegrasses and Priebe perennial prairie. Success has not so far been achieved with *Phalaris tuberosa*, *P. arundinacea* and cocksfoot.

Time-of-Planting Trial.—When a mixture of summer-growing and temperate species is sown, the time of planting has a significant effect upon the ultimate composition of the pastures. Trials over a period of three years with a mixture of *Paspalum dilatatum*, *Phalaris tuberosa*, H1 ryegrass, cocksfoot, Irrigation white clover and Montgomery red clover have demonstrated that:—

(*a*) In February and September plantings, paspalum germinates well and grows rapidly, suppressing the temperate species. The pasture develops into a paspalum-white clover mixture within 12 months.

(*b*) In April plantings, the paspalum is slow to develop and receives competition from the temperate species. The final pasture is a mixture of H1 ryegrass and white clover principally, with some cocksfoot, phalaris and paspalum.

(*c*) In June plantings no germination of paspalum occurs and the pasture develops as a mixture of temperate species.

Grazing Management Trial.—This trial has been run over a period of four years to investigate the effects of a number of grazing treatments, using dairy cows, on the production and composition of irrigated pastures. Spelling periods between grazings varied from 15 to 30 days, with some longer spells in a few treatments at certain seasons. After three years some of the treatments involving the shorter spells were giving only 64 per cent. of the pasture yield recorded in the first year. Longer spell treatments were much better, one yielding the same high level of production (around 40 tons per acre per annum) as in the first year. These trials brought out the importance of strict avoidance of over-defoliation of the pastures, particularly when temperatures are high.

Other Investigations.—Priebe perennial prairie sown with white clover has given very good results and over the first summer-autumn season has been superior to H1 ryegrass, cocksfoot and *Phalaris tuberosa*, each with white clover. Further studies with annual winter pastures confirm earlier findings that satisfactory regeneration and growth of early strains of subterranean clover, especially Yarloop, can be obtained every year. Regrowth of Louisiana white clover as a seasonal winter pasture has been outstanding. White clover is still showing some response to the fertilizers containing sulphur applied in 1956. A Gatton strain of Wimmera ryegrass made outstanding growth during the winter. In association with white clover it provided five good grazings within six months of planting and in this period produced 31.53 tons of green material per acre, an average green growth rate of over a ton per acre per week.

Non-Irrigated Pastures.

The unirrigated pastures were subjected to very severe drought conditions throughout 1957 and so provided only a little grazing during the spring and early summer. Lucerne, green panic, Rhodes grass and buffel grass all made good growth after the midsummer and autumn rains; *Phalaris tuberosa* did not recover until mid-autumn; and *P. arundinacea* failed to persist.

Crops.

Lucerne.—Investigations so far have shown that good stands of lucerne can be maintained for at least six years provided sulphur is applied as a plant nutrient. Contrasts in this regard between areas irrigated with well water and creek water respectively are most striking. The former usually contains no salts of sulphur, whereas the latter has a sulphate content of a few grains per gallon. Hay yield figures for an 11-months period were 4.1 tons per acre from areas irrigated from the well, and 9.9 tons from areas irrigated from the creek. With 10 cwt. of superphosphate, which supplies sulphur, well-watered areas yielded 10.6 tons per acre. The average green growth rates per week from these areas were respectively 0.37, 0.92 and 0.97 tons per acre.

Similarly, significant responses were obtained in another trial in which sulphate of ammonia and superphosphate were used as sources of sulphur.

Potatoes.—All varieties tested yielded well in the autumn-planted crop, with Sequoia and Pontiac giving over 10 tons per acre. Exton, Adina, Sebago and Walanga all yielded 9 tons and over. In the spring crop the standard varieties were again among the best yielders, though Kennebec (9.8 tons per acre) was the highest.

Miscellaneous Crop Work.—In a wheat varietal and rust resistance trial, Spica and Festival showed moderate rust incidence but yielded well at 55-60 bus. per acre. Rust incidence was high on Gabo and Koda, and they yielded only 10-15 bus. per acre.

Two new varieties of French beans were grown for certified seed production, and approximately 18 bus. of seed was harvested. A small area of Stardel cotton has been planted for seed increase. Six varieties of Bambarra groundnuts are under trial. The programme of citrus research has been continued in the orchard area. Land and facilities have been made available to other Branches for work on sorghum head smut, potato fungicides, onion weed control, and wheat and oat nursery plots.

Stock.

Fat Lambs.—Very good results were obtained from the season's crop of fat lambs from the Merino-Border Leicester ewes and Southdown rams. The lambing percentage was 123. The lambs grew fast and the first were slaughtered at 63 lb. in 62 days. All carcases were of high quality. The dressed weights averaged just over 32 lb.

There was no occurrence of bloat in sheep or cattle during the year despite the large quantity of clover in the pasture.

BILOELA.

The programme of investigations at the Biloela Regional Experiment Station embraces irrigated and dryland crops and pastures, dairying and pig raising.

Extremely difficult climatic conditions were experienced in the year under review. Rainfall in the first nine months of 1957 yielded only 6.77 in., but winter-sown crops produced well on water stored from good rain received in December, 1956. The summer crops sown on light rainfall in October-November, 1957, on short-fallowed land did not have this advantage, and drought conditions in December and January further reduced chances of profitable production. Late monsoonal rains producing over 7 in. in February allowed plantings of forage crops such as sweet sorghum and Sudan grass, and good yields were obtained.

In a year of such low and poorly distributed rainfall, wheat on long fallows produced well, cotton sown in October suffered severe drought stress which resulted in low yields, and late-sown grain sorghum planted in February suffered such severe midge damage that potentially high yields were lost.

Winter Crops.

Wheat.—Although the rainfall in the growing period was slightly less than 2 in., 11 varieties and strains gave an average yield of 35.5 bus. per acre. In such a dry season there was no rust and some of the older rust-susceptible varieties yielded well. The early-maturing Pusa 4 and Puno produced 40 bus. per acre; they were closely followed by a Puora back-cross strain, Charter and Gabo.

A time-of-planting trial again indicated that late May and early June sowings are most successful. In the past season, an early June planting yielded 45.0 bus., late June 41.0 bus. and late July 21.7 bus. per acre.

Safflower.—Pure seed of Horowitz variety of safflower was produced for distribution, and strain testing for yield and oil content was continued. Evidence obtained suggested that yields of safflower are considerably reduced by rainfall during the flowering period.

Summer Crops.

Cotton (rain-grown).—In a study of cotton production in successive years after ploughing virgin grassland, the first-year crop gave 566 lb. seed cotton per acre from the first pick, whereas second-year land gave 316 lb. and third-year land 285 lb. per acre. A light second pick is expected.

The average yield from cotton in the variety trial will be in the vicinity of 200 lb. per acre. Although the January-February rain promoted healthy vegetative production, fruiting was poor and winter conditions will prevent development of a late top crop.

In pre-emergence weedicide investigations, mainly centred on control of black pigweed (*Trianthema portulacastrum*), excellent results were obtained from using Randox (CDAA) at 5 and 10 lb. per acre. Development of barnyard grass (*Echinochloa crus-galli*) was also effectively controlled.

Cotton (irrigated).—In a furrow-irrigated variety trial with comparisons of no fertilizer and added nitrogen, the average first-pick yield of five varieties was 1,559 lb. of seed cotton. The variety D & PL14 was outstanding for the fifth successive year and produced 1,731 lb. on the first pick without fertilizer. The value of added nitrogen was masked by higher boll losses due to lodging and disease. A light second pick is anticipated and treatments which received nitrogen may yield higher than unfertilized treatments.

A factorial NPK fertilizer experiment was conducted under spray irrigation. Despite severe disease losses the first-pick yield averaged 1,169 lb. per acre and a fair second pick is in evidence. On preliminary examination of data, it appears that the addition of phosphate or potash had no effect on plant growth or yield.

Experiments directed to the control of insects on cotton produced variable results. Four applications of DDT and endrin at fortnightly intervals seemed advantageous with respect to first-pick yields of 1,156 lb. and 1,070 lb. seed cotton per acre, against 878 lb. from unsprayed areas, but second-pick yields were higher in the control group, bringing final production to 1,455 lb. from DDT treated, 1,428 lb. from endrin treated, and 1,333 lb. per acre from the control.

The influence of loss of squares and young bolls is being studied and the effect of severe insect attack is being simulated by manual removal of fruiting parts. Weekly spraying with 0.1 per cent. DDT is practised to avoid the insect factor. A first-pick yield of 1,699 lb. per acre has been obtained from treatments where squares were removed for four weeks after formation, against 1,487 lb. from treatments where no fruiting parts were removed. Treatments wherein fruit were removed for 2, 6 and 8 weeks were comparable to the control block with respect to yield at the first and main picking. In control areas, where no fruit were removed, there was no advantage in yield from weekly spraying over no spraying for the first 11-weeks period.

Sorghums.—It was not possible to plant grain sorghum until early February, and although conditions for growth were good, the crops were ruined by midge, which is frequently a hazard to late-planted crops.

Sugardrip sweet sorghum mother seed was again produced for distribution to certified seed growers, and the variety was also used for silage-making investigations. Yields of 18 tons of green material per acre were obtained. When a mixture of sugardrip sweet sorghum and velvet beans was grown, the latter crop provided 2.3 tons of the total yield of 18 tons.

In water use studies it was found that 1.8 tons green weight per acre of sweet sorghum or 1.2 tons of Sudan grass were produced for each inch of water used by those crops.

Pastures.

Plant Nursery.—A new section of introduction nursery was added during the year. In addition to the dryland pasture species, a section of irrigation temperate grasses and legumes has been established and strains are being selected and tested under local conditions. A strain of *Phalaris arundinacea* and the interspecific hybrid Ronpha grass are showing promising results. The legume *Trifolium semipilosum* has regenerated on low rainfall in the autumn.

Plate 1.—Ronpha Grass, an Inter-specific Phalaris Hybrid, in Plant Introduction Nursery, Biloela.

Seed Increase.—Mother seed of Gayndah and Biloela strains of buffel grass has been produced for distribution to certified seed growers, and seed stocks of some 15 grasses and legumes have been increased.

Rain-Grown Pastures.—The 1957 drought provided ideal conditions for the evaluation of grasses and pasture mixtures. Response after rain in the late summer of 1958 indicated that the buffel grasses had outstanding drought tolerance. In 5-year-old stands, Biloela buffel grass produced 1.62 tons per acre after the

rains, whereas green panic produced only 0.37 tons per acre, and in Rhodes grass pasture there was insufficient regrowth to sample.

Plate 2.—Mother Seed Production Area of Biloela Buffel Grass.

In grass-lucerne mixtures, yields of the grasses were:—Biloela buffel grass 4.76 tons, green panic 3.18 tons and Rhodes grass 0.92 tons per acre.

The value of lucerne in green panic pasture in its fourth year was shown by yields of 8.03 tons of green material per acre from a grass-lucerne mixture, and only 1.61 tons from green panic when grown alone.

Irrigated Pastures.—The use of lucerne, clovers and temperate grass species for high-producing irrigated pasture has been continued. In addition to studying growth and compatability of mixtures, production from a dairy herd maintained on the area is recorded and water use by the pastures is being determined.

In maintaining production from clover mixtures during the year, water usage was high and the area received in 23 applications 50 in. or more of irrigation water per acre in addition to rainfall.

Stock.

Dairy.—Two dairy herds are maintained, one receiving irrigated pasture as the main ration and the other dryland pasture, silage and grazing crops. Production comparisons will be assessed when seasonal calving cycles are established. In 1956-57, production per cow was 53 per cent. higher from the irrigated pastures herd than from the animals maintained on dryland pastures.

In initial bloat prevention experiments, good results were obtained by drenching animals with peanut oil or spraying the pasture with peanut oil or with tallow emulsified in hot water with Lissapol. Tallow spraying reduced costs to 1¼d. per cow per day, compared with 7½d. per cow per day for drenching with peanut oil.

Piggery.—Feeding trials have been continued to determine the most economical rations to produce the required lean type of bacon carcase.

In weaning trials, piglets are weaned at 4 weeks instead of the customary age of 8 weeks. It has been found that these young animals make more satisfactory progress on milk powders and aureomycin mixtures than on rations based on meatmeal or grain.

THEODORE.

This centre, situated in the Theodore irrigation settlement, has been operated as a subsidiary of the Biloela Regional Experiment Station since it was taken over from the Bureau of Investigation in July, 1957.

In addition to pasture investigations, aspects of fat lamb production and sheep husbandry are being studied. The fat lamb studies are based on breeding Corriedale and crossbred ewes to Dorset Horn rams and testing various lambing periods in relation to availability of pastures, fertility of animals and effect of climatic conditions on lambing percentages and growth of lambs. It is anticipated that a carrying capacity of 10 ewes plus lambs per acre can be obtained, but even greater productivity is desirable.

AYR.

The Burdekin Delta, on which this Station is located, is predominantly a sugar cane growing area, but there is much land which can be utilised for the production of other crops, including pastures, and the Station's activities are directed towards investigations relating to these crops. The mean annual rainfall is approximately 50 in., but three-quarters of this falls in the summer wet season. The ready availability of subterranean water for supplementary irrigation removes the main obstacle to farming during the long dry period, while the mild temperatures of the winter period permit the growth of temperate climate crops at an out-of-season period.

Seasonal Conditions.

General drought conditions prevailed in this area during most of 1957. Only 2.70 in. of rain fell in the second half of that year, and constant irrigation was required to maintain crop growth. The wet-season rains of February and March brought some copious falls, which were interspersed with periods of hot humid weather.

Crops.

Maize.—Trials in previous years had shown that a number of varieties, especially hybrid types, produced well when planted immediately after the wet season and grown in the cooler and drier months of the year—that is, in an out-of-season period for this normally summer-grown crop. Irrigation is, of course, used to supplement the meagre rainfall over the growing period. In the standard variety trials of eight hybrids, the variety Fitzroy, with a yield of 103 bus. per acre, outyielded Ensign (92 bus.) and Victory (90 bus.). In a nitrogen fertilizer trial it was shown that the most economical returns were obtained from applications aggregating 5 cwt. of sulphate of ammonia per acre.

Cotton.—Cotton grown with supplementary irrigation without nitrogenous fertilizer yielded 1,083 lb. per acre, whereas treatments receiving 35 lb. of nitrogen (180 lb. of sulphate of ammonia) yielded up to 1,477 lb. seed cotton per acre. Pure seed stocks of two promising selections from D & PL14 and Acala 4.42 were increased. In the current season, trials are in progress to evaluate varieties, fertilizers and plant spacings.

Grain Sorghum.—Coastland and Alpha are the most popular locally grown commercial varieties, and in a trial with other varieties they yielded slightly better than the average for the trial of 23 bus. per acre.

Oats.—A number of varieties were tested in a grazing trial, using Klein and Vicland as the standards. The average total yield over three grazings was over 10 tons per acre, with the varieties Mindo and Bonda producing best at 14.5 tons per acre.

Legume Seed.—The Ayr district appears to be well suited to the production of grass and legume seeds. At the Station, seed of the popular tropical legumes stylo, centro and glycine was collected mechanically from specially sown areas.

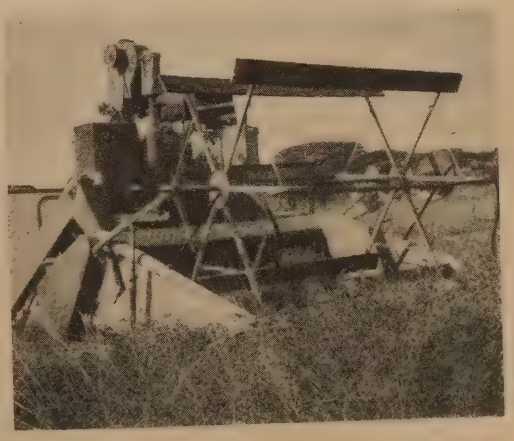


Plate 3.—Mechanical Harvesting of Seed of the Legume Stylo.

Irrigated Pastures.

The para and centro grass-legume mixture again proved to be the most productive of the irrigated pasture mixtures in terms of liveweight gains of the stock depastured on them. There was little to choose between Rhodes grass-stylo and guinea grass-stylo mixtures on performance data.

Plate 4.—Irrigated Tropical Pasture of Andropogon gayanus and Centro Used in Beef Cattle Fattening Studies.

Centro continues to show dominance and is gradually encroaching into all swards. The ability of this legume to stimulate the growth of associated grasses makes it a particularly valuable component of tropical pastures.

The average liveweight gain of just over 1 lb. per beast per day was less than in previous years. The decline can be attributed largely to a serious outbreak of ophthalmia in the herd.

Horticulture.

Pineapples.—Plantings made in December, 1956, January and February, 1957, in a time-of-planting trial made satisfactory progress and were gassed at appropriate periods on a monthly basis. The harvesting of this crop has commenced. A trial to investigate the potentialities of rough-leaf pineapples in this area has been established, with six strains under test.

Bananas.—A trial on the effect on yield of fruit of frequencies of irrigation made good progress, but seasonal rainfall interfered with the proposed plan of irrigations, necessitating a re-start of the experiment.

Tomatoes.—Of eight varieties tested and grown on wire trellises, Q3 and Bowen Red were shown to be the most suitable, with yields of more than 11 lb. per bush.

MILLAROO.

The Millaroo Regional Experiment Station, established in 1955, is located on the Burdekin River 40 miles upstream from Ayr. Some 1,200 acres of land, which include representative areas of the major soil types, have been acquired and trials have been established to determine the agricultural and pastoral potentialities of the region to be served by the Burdekin River irrigation project.

In the present settlements, farms have been established on levee bank soil types, where tobacco is the principal crop. Alternative crops such as French beans, cotton, maize, sorghum, potatoes and peanuts are grown in small quantities. On the Station these crops are being studied on the levee soils, and investigations have been extended to production of rice, cotton, maize, beans, sorghum and pastures on the heavier flood plain soils.

Climatic conditions were favourable in 1957-58. The wet-season rainfall of 31 in. received in three months, February to April, accounted for 72 per cent. of the annual precipitation of 43 in.

Crops.

Tobacco.—A range of tobacco trials was successfully grown and a series of short-course and long-course rotations involving tobacco, Rhodes grass, cotton, maize, sorghum and beans was established.

Trials to assess the value of seedbed sterilization by heat from burning antbed and by applications of methyl bromide for control of root-knot nematodes resulted in outstanding initial development of seedlings in beds treated with antbed. However, this effect was no longer obvious when seedlings from different seedbed treatments were planted out and there were no apparent differences during subsequent crop growth. Yields of cured ungraded leaf averaged 1,402 lb. per acre and there were no significant differences due to initial seedbed treatments.

In an appraisal of methods for blue mould control, systematic spraying with a zineb fungicide was compared with priming of the mould-infected lower leaves of the tobacco plant. The yield of cured leaf from the two treatments averaged 1,403 lb. and did not significantly exceed the yield of 1,355 lb. from untreated plots. The average value of graded leaf, £588 per acre, from the treated areas similarly did not significantly exceed the rate of return, £569 per acre, from the control areas.

Cotton.—Reasonable yields were obtained from all plantings of cotton even though climatic conditions resulted in rather tall growth and incomplete development of bolls. The main cotton plantings were made in March immediately after the wet season, and harvestings were effected in the September-November period.

In a plant-spacing trial of two varieties, stands of 20,000 plants per acre giving 1,282 lb. seed cotton per acre significantly outyielded populations of 12,000 and 40,000 per acre. In this trial Acala 5675 significantly outyielded Miller 43.9.0 at all plant spacings. In the variety trial of six types for irrigation areas in the north, D & PL14 yielding 1,427 lb. per acre was significantly better than the others. Acala 5675 has promise but Miller 43.9.0 appears unsuitable for irrigation areas of the Burdekin.

Maize.—High-yielding maize crops were produced. The hybrid Victory again gave excellent results. Trials were sown in March and harvested in October. Victory was superior in the variety trial, yielding 107 bus. per acre, and in plant-spacing trials with this variety, stands of 16,000 and 20,000 plants per acre yielded 123 bus. per acre, to significantly outyield stands of 12,000 plants per acre. The result from all plantings, which included some untried varieties, was very good, some 404 bus. of grain being harvested from 4 acres.

Pastures.

Production of pasture seeds can be a profitable undertaking, and as grass is recommended to precede tobacco, grass seed harvesting has been investigated. A yield of 560 lb. of seed was obtained from 6 acres of Rhodes grass despite rather dry conditions in mid-1957 and loss of seed during the wet-season rains of 1958.

A plant nursery has been established and a range of introduced and indigenous species is under observation.

Trials on Heavy Soils.

Initial cropping trials with cotton, maize, grain sorghum, oats, wheat and canary seed on the oaky clay loam soil have not been successful. Reasonable results were obtained from plantings of rice and linseed. Establishment of a stand was improved in row crops by bedding and hill planting, and rather heavy applications of fertilizers induced fair early growth from some crops. Final yields from all crops harvested were very low and damage to grain crops by birds and insects was severe. Further trials are now under way.

Grazing of some 25 acres of para grass-centro pasture on Baratta-type soils commenced in May. Observations will be made on pasture management and production and on weight changes of Hereford steers.

KAIRI.

The experimental programme is based on agriculture, dairy-farming and pig raising, and rotations are extensively employed to measure the influence of mixed farming practices in overcoming soil fertility and structure decline, which is so obvious in areas cropped to maize continually. Considerable attention is also directed to pasture research, forage crops and grazing management.

Rather atypical climatic conditions were recorded during the year under review. No frosts were registered and following a record dry spring the summer rains were above average. Opening storm rains in November were followed by nine weeks of dry weather and early-planted district crops experienced great stress. However, the second and main plantings benefited by exceptionally good rains, aggregating 41.41 in., from early January to the end of March.

Crops.

Maize (1956-57 crop).—Plantings were made in November and December, the latter experiencing some storm damage. Production from all maize areas on the Station averaged 32.6 bus. per acre, which compares favourably with the district average of less than 20 bus. per acre. The highest yield from bulk areas was 58.0 bus. per acre.

In a combined plant spacing and fertilizer trial, populations of 11,400 plants per acre (approximately 12 in. plant spacing, 44 in. row spacing) significantly outyielded stands of 9,700 plants per acre (approximately 15 in. plant spacing, 44 in. row spacing) on land three years out of pasture, whereas no differences were obtained on land in its first year after pasture. No significant differences due to side-dressings of sulphate of ammonia at 200 and 400 lb. per acre were obtained in either area.

An experiment was initiated to study the long-term effects on soil structure and plant diseases of growing maize on the same land each year with 12 in. plant spacing, against the common Tableland spacing of 18 in. The 18 in. spacings yielded 51.1 bus. per acre and produced significantly more double-ear plants, whereas the 12in. spacing yielded significantly higher with 64.7 bus. per acre but contained more diseased cobs and nubbins.

In an annual assessment of three Durum and three Dent strains, top yields of 84.0 bus. per acre were obtained from strains in the two groups. Data over a 5-year period have shown only slightly higher yields from Durum maize strains and they appear somewhat less susceptible to certain diseases and weevil attacks.

In maize silage investigations, the growing of velvet beans with the maize resulted in 15 per cent. of silage volume being contributed by the legume and the protein content of the mixture (10.1 per cent.) being 1.5 per cent. higher than from maize silage alone.

Oats.—Time-of-planting trials have shown that there are advantages in planting early and as soon as possible after the wet-season rains. Late plantings experience drier conditions and disease incidence is much higher. April plantings of varieties such as Bovah, Benton and Klein provided three or four grazings and produced up to 8 tons of forage, whereas yields from June plantings were slightly over 1 ton per acre and only one grazing was obtained. In an oat variety hay trial, the new introduction Saia performed well and yielded 5.1 tons of hay, while Clinton and Benton gave 4.4 tons.

Miscellaneous.—In time-of-planting trials of hay and grazing varieties of wheat and barley, yield advantages were obtained from early planting.

Mung bean gave excellent results as a green manure crop, and yields of up to 11 tons of green material per acre were obtained.

Testing of 15 new varieties of fodder cane has commenced and planting material of previously approved varieties—Co.301 and Q.50—has been made available to farmers. The fourth ratoon stands of Co.301, Q.50 and China yielded 46, 28 and 23 tons per acre respectively, to bring progressive total yields of these stands to 200, 158 and 103 tons per acre respectively. Other forage crops under investigation include arrowroot, mangels and sweet sorghum.

Potato fertilizer trials have been initiated.

Pastures.

Studies on establishment and management methods and the use of fertilizers have been continued, and some newer pasture plants are under observation.

It has been found that lack of nitrogen is the main factor limiting growth after the flush January production. Growth during the dry period of late winter and spring is normally better from Rhodes grass than from green panic, while firmly established stands of buffel grass and of guinea grass and lucerne are also capable of moderate production. For wet-season pasture, the production from green panic with lucerne is outstanding, although guinea grass with the legume glycine, and elephant grass mixtures, have produced well.

Production of Rhodes grass declines in the second or third year after establishment, particularly during the autumn to spring period, and experiments to determine the value of applications of nitrogen in maintaining growth have been initiated. On third-year pasture, an early April application of 4 cwt. of sulphate of ammonia per acre resulted in production of 26.8 cwt. of oven-dry grass per acre in the May to July period; this supplied 444 lb. of protein per acre. The yield from unfertilized treatments was only 8 cwt. of grass and 86 lb. of protein.

Applications of urea have also been effective in stimulating late summer and autumn growth of Rhodes grass and lucerne.

In trials comparing methods of establishing Rhodes and green panic grasses in lucerne stands, satisfactory mixed pastures have been obtained by oversowing the grasses after spring tining, discing or undercutting of the lucerne stand. Results were unsatisfactory when no land preparation was done or when the lucerne stand was ploughed.

Preliminary trials on incorporating *Glycine javanica* in grass stands have shown that oversowing of glycine in March is satisfactory if the land is initially lightly ploughed. Sod-seeding of the legume in February was not satisfactory, as the vigorous regeneration of grass in the wet season prevented legume seedling development.

Production from elephant grass pasture was exceptionally high after drought-breaking rains in January. In a period of three weeks the green weight yield was 94 cwt. per acre.

In grass silage investigations an application of 2 cwt. of urea per acre resulted in a yield of 7 tons per acre from a Rhodes grass and lucerne mixture and improved the protein value of the silage.

Stock.

Jersey and A.I.S. herds are maintained for grazing of pastures and for experimental work. Despite the long dry season the feeding of silage as the main supplement allowed reasonable production from all stock.

The Artificial Breeding Centre has operated efficiently and within the Station herd the use of artificial insemination has largely overcome infertility problems.

The Tamworth pig stud and Large White crossbred animals have been used for feeding trials related to different fibre and protein levels and additives such as molasses. Preparation and testing of rations for early and pre-weaning feeding of pigs has been continued.

A poultry section of 750 birds has provided facilities for a series of feeding trials related to costs and production, and the effect of artificial lighting on egg production is also being investigated.

The results of animal investigations with dairy stock, pigs and poultry are reported by the respective Branches co-operating on the Station.

HORTICULTURE BRANCH.

Dr. S. A. Trout, Director of Horticulture.

The three main activities of the Horticulture Branch are research on problems of field production and preservation and storage of horticultural crops; extension activities covering both production and distribution; and regulatory services which embrace both State and Commonwealth legislation. In each sphere of activity considerable progress was made by the Branch during the year under review.

Horticulture Branch plant breeders have produced a rust-resistant bean and a passion fruit more resistant to disease. In the laboratory, improved methods of storing apples were developed and these have been applied successfully on a commercial scale. It is pleasing to record, also, that a Food Preservation Laboratory estimated to cost £114,000 is now in course of erection.

On the extension side, the formation of a Farm Advisory Committee of growers in the Mary Valley may set a new pattern for horticultural advisory services.

Efforts over the years to develop a satisfactory trade with the United Kingdom to take care of the greatly expanding apple production in the Granite Belt have at last been successful. Co-operative efforts by shipping companies, exporters, growers and Departmental officers resulted in excellent returns for a record consignment of approximately 27,000 cases of apples sent to the United Kingdom from Queensland in February and March of 1958.

SEASONAL CONDITIONS.

Some parts of the State had a rather difficult year because of the failure of summer rains in 1956-57 and the sub-normal nature of the rainfall during the remainder of the year. The effects have been most pronounced in non-irrigated areas.

Lack of soil moisture in the October-January period restricted fruit size in all stone fruits and in early-maturing varieties of pome fruits. However, relief rains fell in January. The total output of fruit from the Granite Belt was about average, and quality was generally good.

In non-irrigated areas, much of the citrus, avocado and other fruits was shed. Even in irrigated areas, the citrus crop, though of average dimensions, suffered to some extent from salt accumulation in the soil.

Pineapples cropped normally and fruit size, though initially small, improved rapidly after the January rains; a good summer harvest of excellent fruit was obtained. The late summer and winter rains of 1958 hold promise for a good crop of winter and spring bananas. Papaw plantations withstood stress conditions remarkably well, and yields in 1958 should be good.

Vegetable growers had a mixed year. Tomatoes were available in quantity, and for most of the year the markets were over-supplied with fruit of first quality. Many vegetable crops failed owing to lack of adequate water, and a considerable amount of low-grade beans reached the market. Production of winter vegetables was difficult following warm, humid conditions in autumn.

RESEARCH PROJECTS.

Pineapples.

Earlier work had shown that fertilizer schedules previously used in the pineapple crop supplied insufficient potassium on many types of soil. Further trials completed during 1957-58 at Palmwoods, Gympie and Bundaberg have indicated that the results may have a general application throughout the State. Fertilizer recommendations have been amended accordingly, and growers are quickly adopting the new practice. Trials at the Maroochy Experiment Station include forms of potassium in fertilizer mixtures, fertilizer placement and nitrogenous foliage sprays.

The principle of "forcing" pineapples to ensure the production of a plant crop in summer and a ratoon crop in the May-June period 15 months later is now generally accepted in the industry as an effective method of overcoming the problem of black heart in winter-harvested fruit. In southern Queensland the forcing treatment is highly effective, but in central and northern areas inconsistencies occur. This point is being investigated at Rockhampton and Ayr.

Improvements in soil conservation techniques have been effected during recent years. Experimental work at the Maroochy Experiment Station has demonstrated that soil loss during heavy rains is greater when inter-row drains are placed between adjacent paired rows of plants than when they are spaced more widely apart. Inter-row drains are now normally installed between every third pair of rows on all but the steepest slopes.

Liming is practised in pineapple growing areas on the North Coast, partly as a corrective for excessive acidity brought about by heavy fertilizer applications, and partly to ensure satisfactory growth in cover crops established during the intercycle period. A series of liming trials has been established in an attempt to standardise current practice.

Observations made at the Northgate cannery on the canning qualities of the summer and winter crops from North Queensland processed at Northgate indicate that the smaller fruit cans satisfactorily, but the larger fruit is often soft in texture and more difficult to can. The production of smaller fruit should overcome many of the problems which have been experienced in canning the North Queensland crop.

A disorder known as "woodiness," which has many of the characteristics of the bacterial disease marbling, has now been diagnosed in Queensland pineapples. Hawaiian experience suggests that woodiness, which appears to be widely distributed in Queensland, is hereditary, and tops from affected fruits have been planted at Maroochy Experiment Station for observation.

The possibility of using washed raw sugar in lieu of refined sugar for canned pineapples in districts where sugar cane is milled has been investigated. The results obtained were not satisfactory, as the canned pineapple became very discoloured and developed an abnormal molasses flavour. Further investigations on dehydrated pineapples have been conducted, and very satisfactory results have been obtained with pineapple crush, which reconstituted to an attractive product.

Bananas.

Current fertilizer recommendations in the banana crop have been established largely through grower experience with a wide variety of mixtures. The absence of better accredited formulas has been due primarily to difficulties in maturing the crop at approximately the one time. Recent studies on types of planting material have demonstrated that the fruiting period in the plant crop can be reduced by the use of bit planting material selected for uniformity in terms of age of the parent plant, weight and eye development. This makes possible the initiation of fertilizer trials with reasonable prospects of success. Accordingly, such a trial has now been established at the Maroochy Experiment Station.

The superiority of bits over suckers as planting material was demonstrated effectively some years ago in southern Queensland. They give uniformity in the stand, produce greater yields and permit effective control of time of bunching. The applicability of the results elsewhere in the State was demonstrated during

the past year in the Wet Tropics. In this area, some growers are interested in controlled cropping as a method of supplying southern markets with fruit in winter and spring. Bit plantings seem essential if this is to be achieved.

Regular desuckering is essential where the owner aims at producing quality fruit at particular periods of the year. The current recommendation is to desucker regularly and apply the kerosene treatment when the suckers are in the "peeper" stage.

A trial has been established at the Maroochy Experiment Station to determine the effect of plant spacing on yield and sucker development. Although the trial is still in the early stages, it is apparent that close spacing reduces the number of suckers produced and also their rate of growth. The work suggests that closer spacing is permissible in the plant crop than in the ratoon.

The banana plant is reputed to have a high water requirement, and water usage studies are in progress at the Ayr Regional Experiment Station. The results so far indicate that loss of water by evaporation from the surface of the ground is much greater than has been supposed hitherto, and that water consumption by the banana plant may not be particularly high.

The possibility of exporting bananas to countries north of Australia is being considered and work is being initiated to determine whether wax coatings will increase the cool storage life of the fruit. In previous experiments wax coatings have considerably extended the storage life of bananas at atmospheric temperatures.

Papaws.

Until recently, variability in planting material made it difficult to obtain significant results from fertilizer trials in the papaw. However, now that pure lines are available the subject has been re-opened for investigation at the Maroochy Experiment Station.

The Hybrid No. 5 papaw derived from crossing pure lines of Bettina 100A and Petersen 170 should be available to the industry for 1959 plantings. Seed is now being grown under Departmental supervision at Yandina. The release of this variety should lead to increased yields per acre and improved fruit quality in southern Queensland plantations.

Purification of the selected local strains known as Sunnybank and Brookfield is in an advanced stage at the Redlands Experiment Station. The best of the selections are under test to determine whether certain fruit and plant characteristics of possible value to the industry are heritable.

Trials were carried out with strains of papaws grown at the Redlands Experiment Station in order to determine their cool storage life. The papaws kept in good condition for 10 days at 45 deg. F. but rapidly developed ripe rots on removal to atmospheric temperatures, irrespective of the stage of maturity at which the fruit was picked. It is considered that export of papaws to distant destinations is not possible until the problem of ripe rots has been overcome.

Other experiments were concerned with ripening trials to determine whether winter papaws should be ripened before or after transport to southern markets. These investigations, carried out in conjunction with officers of the Victorian Department of Agriculture, showed that papaws ripened in Melbourne can be marketed with less wastage than those ripened in Brisbane prior to transport.

Papaw selections from the Kamerunga Experiment Station are being examined for their suitability for canning; some of the samples have given a very good canned pack, being firm in texture and of very good flavour.

Citrus.

Mandarin hybrids are under observation at the Gatton Regional Experiment Station. The project has as its primary aim the production of new hybrids which will extend the cropping season. The best of these are to be propagated on selected stocks next year and later established in commercial orchards.

Introduced and locally selected varieties and strains of citrus are under observation at the Maroochy Experiment Station and elsewhere. Three locally selected types which show promise are Hickson and Stemp mandarins and a late-maturing Washington navel orange derived from a sport discovered at Gayndah.

The Washington navel orange is not normally a satisfactory variety for coastal orchards owing to its erratic bearing habits. Work at Howard suggests that more consistent bearing may be induced by cincturing the trees at intervals of two or three years. Cincturing is carried out prior to flowering and double cincturing holds greater promise than single cincturing.

The stock-scion trials sponsored by the Citrus Advisory Committee are still in the nursery stage. The young trees are being produced in a commercial nursery near Mundubbera and also at the Redlands Experiment Station.

Small pellets containing volatile ammonium compounds placed in fibreboard cartons have considerably reduced mould development in oranges. The possibility of using ammonia gas to control mould growth during the colouring process is now under investigation. There is a potential market overseas for Queensland mandarins, but little information on storage conditions and the length of storage life is available. Refrigerated space is not always available and consignments are sometimes shipped as deck cargo. Experiments have shown that the Emperor mandarin has a life of three weeks at atmospheric temperatures and six weeks at 45 deg. F.; the comparable figures for the Ellendale variety are four weeks and eight weeks respectively.

Because of the possibility of introducing fruit fly, citrus fruits from Queensland can only be exported to New Zealand if they have been subjected to a cold storage treatment of 14 days at 31 deg. F. The question whether Queensland mandarins will withstand this cold storage treatment is under investigation. Further work has been carried out to determine whether ethylene dibromide, which is being used experimentally for the destruction of fruit fly in infested consignments, will cause injury to citrus fruits grown in Queensland. The incidence of black spot in Valencia oranges from districts where this disease was very prevalent in 1957 was considerably increased by treatment. It appears that ethylene dibromide breaks the dormancy of latent infections, as a similar result has been observed previously with papaws.

Avocadoes.

The stock-scion investigation at the Redlands Experiment Station continues to show promise. Most of the trees are now bearing, and within a few years it should be practicable to determine comparative yields and fruit quality in the several varieties on a range of rootstocks. When this stage has been reached, tree specifications will become standard and the industry put on a sounder basis.

Propagation techniques based on work at the Redlands Experiment Station are being adopted by nurserymen, but the demand for worked trees still exceeds available supplies.

The marketing of fruit from seedling types of avocado trees affects returns from recognised varieties. Laboratory work has therefore been concerned with determining suitable quality standards for fruit grown on seedling trees. The results indicate that a seed cavity not exceeding 20 per cent. by volume and an oil content of not less than 10 per cent. may be suitable market standards. This result needs further confirmation. Restriction on the interstate loading of Fuerte until after Apr. 30, as recommended by avocado growers, has eliminated losses previously experienced with immature fruit of this variety. Efforts to publicise the good features of avocadoes are meeting with success, and good returns for recognised varieties are being obtained on southern markets.

Work is proceeding on the evaluation of market quality, but as climatic conditions have a considerable influence on avocado quality, investigations over several seasons will be necessary. One of the difficulties in marketing avocadoes is that early-picked fruit takes a

long time to ripen and often develops stem-end rots before it is fully ripe. Experiments with the Fuerte variety have shown that exposure to ethylene gas for 48 hours considerably accelerates ripening without attendant mould development, and the fruit ripens more uniformly. Trials with other varieties are in progress.

Macadamia Nuts.

The Macadamia stock-scion trial at the Maroochy Experiment Station is proceeding satisfactorily, but the trees have not yet commenced to bear.

A solution to the problem of commercial propagation is still not in sight, and there is no immediate prospect of any marked expansion in the industry. A detailed study of the several factors which influence the percentage of successful takes in grafted trees has been initiated at Maryborough. It may involve a physiological investigation of the callousing process in relation to age of wood and its nutrient status.

The major portion of the year's crop (18 tons) was processed commercially with very satisfactory results. There is a keen demand for roasted kernels. Some deterioration in quality occurs after long storage, and experimental work is in progress to determine whether cooking procedure is a contributing factor. Nuts cooked in ghee have been rated higher in flavour than those cooked in coconut oil, which is used commercially.

Custard Apples.

Stock-scion trials in the custard apple commenced some years ago in the Redlands district in an attempt to solve the problem of erratic cropping, which may be associated with the propagation of inferior strains and/or stock-scion incompatibility. A range of trees with distinct stock-scion characteristics has now been established at the Redlands Experiment Station for observation. Their performance could have a marked effect on current nursery practice.

Apples.

Apple fertilizer trials established at Stanthorpe will be continued for another five years or so. In the Granny Smith project, responses have again been obtained from high levels of potassium in the applied fertilizer. As a result, high-potassium mixtures are more generally used in the district than hitherto. The Delicious trial located on young trees failed to crop in 1957-58, possibly because of unusually dry conditions.

Chemical thinning of apples continues to attract attention, and ANA (alpha napthalene acetic acid) applied at a concentration of 10 p.p.m. at full blossom seems suitable for Granny Smith and Delicious varieties. A higher concentration (15 p.p.m.) is needed for Jonathan.

Trials have been carried out to determine the effects of various sprays and their time of application on accelerating the maturity of Granny Smith apples. Very promising results have been obtained with 2,4,5-TP and a marked advancement in maturity has been noted on the tree. Such treatment should enable fruit to be picked much earlier for overseas markets and widen the period over which apples can be picked for cool storage.

Work on superficial scald, the main form of wastage in Granny Smith apples, has been intensified and 37 treatments were tested on Granny Smith apples from the 1957 crop. Diphenylamine and the commercial preparation Santoquin were the only substances to give complete control of scald. As these compounds are used commercially to retain carotene activity in stock foods, the question whether the carotenes in apple skins play any part in scald development is now being investigated. Experiments in 1958 are designed to study compounds with similar chemical groupings to diphenylamine in order to understand more fully the mechanism of scald control.

Following Departmental trials over a number of years in which it has been shown that the life of Granny Smith apples can be considerably extended by storage in controlled atmospheres, semi-commercial trials were carried out in 1957. The apples were still in good condition when taken out of the gastight containers in late December and realised top market prices. Although 5,000 cases of the 1958 crop are being stored by this method in the Stanthorpe district, experimental work has not yet reached the stage when controlled atmosphere storage can be recommended as standard commercial practice. The problem of superficial scald, which can occur under controlled atmospheric conditions if the fruit is picked before the optimum stage, has still to be overcome. The application of diphenylamine, which gives complete control of scald, cannot be recommended for commercial use until toxicology studies now in progress in the United States of America have been completed. The results so far obtained are extremely promising.

Grapes.

At Severnlea, the grape varieties Muscat, Waltham Cross and Purple Cornichon are being grown on a range of eight Phylloxera-resistant stocks. Differences in vigour and berry quality between vines are now apparent. None of the stocks improve the performance of Muscat, which is normally grown on its own roots, but Rupestris du Lot, Richter 99 and 18804 show promise for Waltham Cross and Purple Cornichon. Prunings from resistant vines are now being supplied to growers.

There is some indication that time of pruning may have a considerable influence on the incidence of the disorder known as hen-and-chickens in grapes. An experiment has therefore been established at the Redlands Experiment Station to check this point.

Passion Fruit.

A long-term project designed to re-establish the passion fruit industry by the production of disease-resistant varieties made considerable progress during the year. Following the spectacular results obtained at the Redlands Experiment Station, nurserymen are now propagating grafted passion vines with an *edulis* scion and a *flavicarpa* stock. The *flavicarpa* stock gives almost complete immunity to Fusarium wilt, one of the major hazards in the industry. Progenies from crosses between selected *edulis* and *flavicarpa* parents have provided a wide range of material in which a number of lines possess Fusarium wilt resistance and acceptable agronomic characters. Some of these hybrids should be available for commercial trial in the near future.

Preliminary trials have been conducted to determine suitable methods of processing passion fruit, with a view to evaluating the processing qualities of the various strains now being produced at the Redlands Experiment Station. While acidity and pulp colour are important in fresh fruit marketing, flavour is the over-riding factor in canning. As flavour is readily destroyed by heat, rapid cooking equipment for passion fruit pulp is now being designed.

Strawberries.

In Queensland, where the strawberry crop is grown as an annual, time of planting can be critical. This point was demonstrated in an exploratory trial at the Redlands Experiment Station in 1957, when March-planted runners produced almost twice as many berries as those planted in late April. The current year's trial is designed not only to confirm previous results, but to determine the effect of time of planting on vegetative growth, time of flowering, flower production and period of productivity.

Mulches of various kinds have long been used in the strawberry crop. Tanbark is the preferred material but it has undesirable residual effects on soil fertility. Current results indicate that plastic mulches have no undesirable side effects, conserve moisture and keep the fruit clean.

With the expansion of the crop, production is increasingly dependent on artificial manures, and efficient fertilizer usage therefore becomes essential. A series of trials now in progress is expected to show the most effective fertilizer practice.

Plate 1.—Mulching of Strawberries at Redlands Experiment Station. Right, paper mulch; left, black plastic mulch 1/1,500 in. thick.

Although the Phenomenal variety is an excellent strawberry for the fresh fruit market, it has some defects as a processing berry. A series of American types has therefore been introduced and established at the Redlands Experiment Station. These are now being increased, and sufficient planting material should be available next year for comparative trials to assess yield and fruit quality.

Laboratory investigations have been carried out with a view to improving the texture of processed Phenomenal strawberries. The addition of low-methoxy pectin of 0.3 per cent. concentration to the syrup helped to retain the natural colour and shape of frozen and canned berries and prevented weeping of frozen berries after thawing.

Mangoes.

In order to capture the early market for mangoes, there has been a tendency for growers to pick the fruit in an immature condition; in consequence, the fruit shrivels, ripens with poor flavour and develops rots. Investigations have therefore been carried out to study physical and chemical changes during maturation on the tree and during ripening. It has been shown that fruit is fit for market shortly after it attains maximum size. Commencing at a very early stage, there was a progressive increase in the total solids and a corresponding decrease in the acidity content of the fruit as it approached maturity. A total solids content of 15 per cent. for the Kensington and 12 per cent. for common mangoes seems a satisfactory standard of maturity, but this result will require confirmation.

Figs.

The possibility of finding outlets for figs other than jam manufacture has been considered. There is a keen demand for glacé figs for the Christmas trade, but as the fig crop matures in summer the glacé product would have to be stored for a long period if the figs were processed shortly after harvesting. Experiments have shown that fresh figs can be kept in a solution of sulphur dioxide of 0.25 per cent. concentration for eight months and then processed satisfactorily.

Ginger.

Previous investigations indicated that the yield of high quality ginger is determined by the time of harvesting. Yield data in the trials were affected by sunburn injury during the early stages of growth, but in the last year's work this was partially overcome by mulching and shading.

Simple methods for determining optimum time of harvesting have yet to be evolved. If ginger is harvested too early, yields are low and the material is too soft. If picked too late, the rhizomes contain a high percentage of stringy material. As a result of laboratory experiments over several years, commercial enterprise is now able to produce a Queensland product of world standard for which there is a very keen demand.

Tomatoes.

A fertilizer trial at Stanthorpe on a relatively infertile soil gave no clear-cut indication of responses of tomatoes to the major nutrients, N, P and K, probably because the cropping period was cut short by frosts. In a second trial at the Redlands Experiment Station, carried out in conjunction with the Chemical Laboratory, no responses to side-dressings of nitrogen were obtained, probably due to heavy rain during the growing period and the consequent leaching of nitrates from the root zone. A response to basal phosphorus was obtained in this trial, even though the phosphate status of the soil was high. It seems clear that any assessment of plant response to added nutrients will have to take into consideration the movement of applied fertilizer through the profile and actual consumption by the plant at different stages of growth. In commercial practice, luxury basal dressings take care of abnormalities in the season and side-dressings can be based on plant appearance and growth rates.

Plant improvement programmes in the tomato have been handicapped for some years past by the high incidence of leaf shrivelling virus during cool weather. The prospect of producing commercial types of tomato by selection within existing disease-resistant material is far from bright, mainly because of the high fruit quality standards set by the main commercial varieties such as Q2. The current emphasis is therefore on incorporating disease resistance into established Queensland varieties by suitable hybridisation. Some of the progenies now on hand are approaching commercial standard.

Pulse Crops.

The project designed to produce a rust-resistant bean with the yield potential and pod quality of Brown Beauty has culminated in the release of Redlands Belle and Redlands Beauty for commercial trials. These are the result of a co-operative project between the Horticulture Branch and the Plant Pathology Section. Both lines have been bulked by the Committee of Direction of Fruit Marketing under Departmental supervision, and stocks will be available for commercial plantings in the spring of 1958. Both varieties should prove invaluable in areas where rust is a limiting factor to production.

Stringlessness in beans is becoming increasingly necessary for both processing and domestic requirements. Commercial stringless varieties at present available do not perform well in Queensland and breeding work has been concerned with producing a stringless variety comparable in quality to commercial string beans and

suitable for Queensland conditions. Some lines produced from crosses between stringed and stringless parents show distinct promise, and it seems reasonably certain that a high class stringless variety will eventually be produced.

The pea industry is a relatively minor one in Queensland but could be expanded. During the past three years, the performance of canning varieties grown in southern States has been compared with that of Greenfeast and Massey, the fresh pea varieties produced here. The range of material collected for this work presented an opportunity for hybridisation with the object of producing plant types with the bush characteristics of Massey and better yielding performance. Some of the progenies now under test have not only a high yield potential but also good pod quality.

Cruciferous Crops.

At the Redlands Experiment Station cabbage trials have been concerned with plant spacing and fertilizer practice. The 1957 trials demonstrated that optimum spacings for conical-headed types such as Early Jersey Wakefield is 3 ft. between rows and 14 in. between plants in the row. For the ballhead types such as Enkhuizen Glory, wider plant spacing in the row is essential and 16 in. seems to be the best for practical purposes.

Rates of fertilizer application in cabbage above the recommended schedule of 10 cwt. of 5:13:5 per acre as a basal dressing and two side-dressings of sulphate of ammonia at 4 cwt. per acre proved unnecessary with close spacings, and it would appear that this amount of fertilizer is adequate to cater for exceptional seasonal conditions. In a second trial, it was shown that the response to side-dressing fertilizers is inversely proportional to the amount of basal fertilizer used; high basal applications reduce the response to nitrogenous side-dressings. The phenomenon suggests that side-dressing responses in the red-brown loams are primarily associated with the availability of nitrates in the root zone.

Root Crops.

Plant spacing can have a considerable effect on both yield and root quality in carrot crops. In trials at the Redlands Experiment Station, it was shown that maximum yield was normally associated with no thinning. However, grower returns are determined by yields of marketable roots—i.e., roots of sizes which command a premium on the market. On this basis, a 2–3 in. spacing is the commercial optimum for the variety Osborne Park grown on the red-brown clay loams.

Salad Crops.

In some areas, lettuce production during the summer months may be handicapped by variability in plant type and premature heading. It would appear that the variety grown at that time of the year, Pennlake, may show insufficient heat tolerance for southern Queensland. The trouble could possibly be overcome by selecting within the variety for local conditions and then maintaining selected types by growing seed under supervision in Queensland, or alternatively in southern States from mother seed supplied from Queensland. The validity of this thesis is being checked at the Redlands Experiment Station.

STORAGE AND PROCESSING.

Antibiotics have been used with some success overseas to control bacterial wastage in certain vegetables. In Departmental experiments the storage life of peas at atmospheric temperatures was not increased by dipping them in a solution containing 50 p.p.m. of oxytetracycline; on the other hand, wax emulsions have considerably reduced weight losses and extended the life of carrots during storage. Work on dehydro-freezing, which combines the advantages of dehydration and quick-freezing, has been continued in regard to time of blanching and extent of dehydration. A 4 min. dip in hot water followed by a reduction in weight by 50 per cent. was the most satisfactory treatment for peas.

Processing trials with potato crisps were continued in regard to cooking temperature and variety. The Sebago variety gave the best results. Difficulties have been experienced commercially in manufacturing crisps from cool-stored potatoes and investigations of this problem are being designed. Methods adopted for processing Macadamia nuts have been applied successfully to peanuts, and yields of whole blanched nuts have been increased from 60 to 75 per cent. Experiments are now in progress to determine blanching conditions in relation to the moisture content of peanuts.

REFRIGERATED TRANSPORT.

Further tests have been made with the Preco wagon, the self-cooling type equipped with fans, in order to study the cooling rates of irregularly sized packages, stacking arrangements and the extent of a warm spot which was evident in previous trials. The first trial was made with a consignment of peaches and plums loaded at Glen Aplin during the Christmas period and unloaded at Cairns several days later. The fruit, which had been loaded hot at Glen Aplin, arrived at Cairns in excellent condition. In the second trial, with a mixed consignment of fruit and vegetables from the Brisbane markets, the train was delayed several days through floods, and although cooling rates were not as good as usual the consignment arrived in good condition. The main purpose of the test was to determine the effect of stacking and results indicated that no change in the present method is necessary.

The Preco wagon was designed as a general-purpose wagon to be used for many perishable commodities; it has advantages over other insulated wagons in that it is capable of cooling down hot loads and will maintain uniform temperatures during transit. When these advantages become more widely known, wagons of this type will be used more extensively for the distribution of agricultural products. This type of wagon may be suitable for the carriage of bottled milk to country towns, and trials are therefore being organised in conjunction with officers of the Division of Dairying.

PACKAGING.

Following experimental work over several seasons with different types of fibreboard cartons, the telescopic type of 1 bus. capacity measuring 17½ in. by 10½ in. by 11½ in. has now been accepted commercially as a suitable package for apples and citrus fruits. Fibreboard specifications are now being considered by manufacturers, and the container may be gazetted under the Fruit and Vegetable Grading and Packing Regulations. The carton has an advantage over the wooden case, in that it gives the fruit greater protection against bruising. It is particularly suitable for interstate transport by road or rail, but cannot yet be recommended for sea transport.

Half-bushel dump and half-bushel flat telescopic cartons are under trial for the packing of tomatoes, avocadoes and stone fruits. A carton of quarter-bushel capacity is being considered as a consumer package. Exploratory trials with polythene case liners have indicated that this method of packaging may give better control of withering in apples. More extensive experiments are now in progress with Delicious and Granny Smith apples from the 1958 crop.

EXPERIMENT STATIONS.

Redlands Experiment Station.

This Station has had a very successful year. The scope of its work should be materially enhanced by the donation of a 1,600 sq. ft. glasshouse by the Vegetable Sectional Group Committee and the Other Fruits Sectional Group Committee of the Committee of Direction of Fruit Marketing primarily for use in plant improvement projects. This facility should considerably reduce the hazards associated with winter cropping in beans and tomatoes and provide the requisite protection for valuable pedigree material.

Some 12 acres of typical red-brown clay loam was acquired during the year by purchase. The additional area should make it possible to adhere to accepted principles of land management without curtailing the experimental programme.

The Station includes a substantial area of grey soil overlying a heavy clay which is representative of some types of land recently brought into vegetable production in the Brisbane district. An attempt is being made to

assess its horticultural potential by drainage works, tillage practices, and the addition of organic matter and nutrients.

Maroochy Experiment Station.

This Station maintains its primary function as a research and demonstration area for plantation crops such as pineapples, bananas and papaws. Some attention has also been given to crops such as ginger and strawberries, which, though of minor importance on the North Coast, are of considerable technical interest.

FOOD PRESERVATION LABORATORY.

The exacting climatic conditions in Queensland make distribution of farm produce to distant markets very difficult, but the problem could be greatly simplified if fuller information were available on the potential keeping quality of horticultural crops. Such data can only be obtained by picking the crop at selected stages of maturity and keeping it under accurately controlled storage conditions. In the storage of fruit and vegetables, temperature, humidity and composition of the storage atmosphere have a very marked effect on storage life. To enable such vital information to be obtained, Cabinet approved on Aug. 1, 1957, of the erection of a Food Preservation Laboratory at Hamilton in close proximity to the Butter Marketing Board's premises. The building, which was commenced in February 1958, is to occupy an area of about 10,000 sq. ft. and will contain a library, offices, a number of well-equipped laboratories for studying physical and chemical changes in storage, eight constant-temperature rooms for storing fresh fruit and vegetables, two low-temperature rooms for storing frozen foods, a quick-freezing plant and canning equipment. It is anticipated that the laboratory will be completed during the 1958-59 financial year.

EXTENSION.

Advisory services in horticulture have been concerned largely with problems arising out of sub-normal rainfall in the more important horticultural districts. This involved drives, to ensure first that the limited amounts of water available for irrigation were used effectively, and secondly, the adoption of tillage operations which tend to prevent loss of moisture by evaporation from the soil surface.

The effective use of limited water supplies on small-crop farms presumes an adjustment of the cropping programme so that crops of high value get a full quota of water. In orchards, on the other hand, if soil moisture is insufficient to supply the normal requirements of the trees, it is better to supply adequate amounts to portion of the orchard and put the balance of the trees on a subsistence quota.

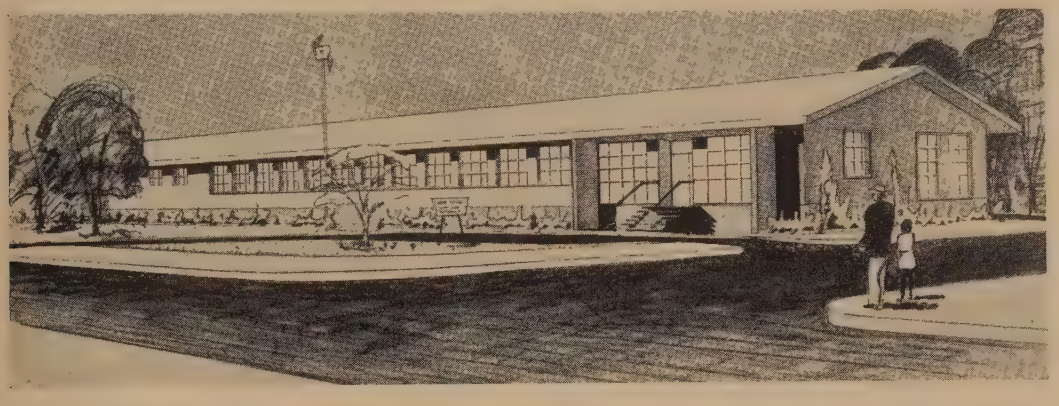


Plate 2.—Artist's Sketch of the Food Preservation Laboratory Under Construction at Hamilton, Brisbane.

Cultural practices designed to reduce surface evaporation were also featured in the advisory programme. Points emphasised included mulching in vegetable crops and small fruits, reduced tillage in tree fruits with a relatively deep rooting system, and effective control of weeds.

Farm Advisory Service.

The farm advisory service continues to make heavy claims on the time of staff. This type of service might be supplied, in part at least, by established and efficient growers with the necessary faculty of leadership. This would facilitate the work of the advisory staffs, who could then deal with groups of growers and grower organizations more effectively. This matter is now receiving attention in the Mary Valley, where a Farm Advisory Committee, comprising growers selected by the Pineapple Sectional Group Committee delegate in consultation with the Senior Adviser in Horticulture for the district, is operating. The Committee hopes to institute a grower-to-grower advisory service and organise result demonstrations and group discussions.

Group Discussions.

Several group discussions have been held during the year, in particular at Ayr, where bean seed production on a commercial scale is a relatively new industry, and in the Caboolture-Beerwah district, where grower interest in common problems is rather pronounced. Their main characteristic is the exchange of views among growers on matters of current importance. Such discussion groups cover much of the ground which would otherwise have to be handled on individual farm visits and therefore effect a considerable saving in the time of extension staff.

Packing Instruction.

School packing classes have been conducted in conjunction with the Department of Education at 22 schools in the Stanthorpe, Redlands and North Coast districts. The staff has been strenghtened by the appointment of another packing instructor, and more advanced classes are being arranged. Films on the harvesting, handling and packing of fruits and vegetables have been shown at Amamoor, Cooroy, Tamborine Mountain, Wynnum and Kallangur. A complete series of packing charts on the main fruits and vegetables grown in Queensland is now available for distribution to growers.

Field Days.

Six field days, on strawberries, bananas, avocadoes and pineapples, were held during the year, and all were very well attended.

Publicity.

Press and radio facilities were used consistently during the year in order to focus attention on matters of horticultural importance. *Queensland Fruit and Vegetable News* continues to be a medium for current articles on horticultural subjects.

SPECIAL SERVICES.

By agreement with nurserymen and the citrus industry, all budwood and seed required for the propagation of citrus trees in Queensland is supplied by or through the Horticulture Branch. The service is controlled from the Burnett district, and distribution takes place from Gayndah, where the requisite facilities for handling the

material are located and the bulk of the budwood is cut. Approximately 116,250 buds and 158 lb. of seed were distributed during the year.

No strawberry areas were approved as sources of planting material in 1957. Virus diseases were much more widespread than for many years past, and none of the areas registered for inspection reached the prescribed standard for freedom from disease. The Strawberry Runner Approval Scheme therefore lapsed for the time being. Severe rogueing was carried out in some of the less affected areas and runners from these crops are being propagated at the Redlands Experiment Station and on a number of private farms. Sufficient disease-free material will, it is hoped, be available to recommence the Scheme in 1959.

As in previous years, certified tomato seed of the varieties Q2, Q3 and Q5 has been produced under Horticulture Branch supervision. Grower demand for the seed has been fairly constant for several years, sales being equivalent to about 30 per cent. of Queensland's total consumption.

The Horticulture Branch has under its jurisdiction various Government gardens, the registration and inspection of nurseries, and the inspection and quarantining of nursery stock imported from overseas countries. In addition, there are many enquiries for information on home gardening. In order to provide information on the basic principles of home gardening and nursery practice, a Correspondence Course was commenced by the Department of Education in 1958 with the assistance of officers of the Horticulture Branch, the Chemical Laboratory and the Brisbane City Council. During 1958 about 120 students enrolled for this Course.

REGULATORY.

The following emendations to the Diseases in Plants Acts were made during the year:—

(*a*) Measures for the control of bunchy top and weevil borer in banana. The use of 2,4-D for the eradication of bunchy-top infected plants in the Wet Tropics, where regrowth is troublesome, is permitted as an alternative to the mechanical destruction of the stool. The same regulation authorises the use of BHC for weevil borer control.

(*b*) Grade standards for citrus. Citrus trees offered for sale must be budded at a height of not less than 4 in. above ground level as a precautionary measure against root rot infection after planting.

(*c*) "A" grade varieties of citrus. Thornless Lisbon has been included in the list of "A" grade varieties of citrus.

Over a period of five years up to 1954, the number of banana plants infested with bunchy top showed a steady decline. Since then, there have been a few outbreaks, and these have been effectively controlled within a reasonable period. A special Order in Council was introduced in 1954 to deal with a major outbreak in the town of Innisfail and adjacent areas, and bunchy top has been all but eradicated from the area. Close supervision of the area will still be maintained.

OVERSEAS EXPORT.

During the year under review Queensland exported a record number of 27,128 cases of apples to the United Kingdom, and to other countries 4,853 cases of apples, 994 cases of pears, 8,941 cases of citrus, 19,612 cases of other fruits and 20,000 packages of vegetables.

There is a profitable market for Australian apples which reach the United Kingdom before the end of April, but previously lack of shipping space had precluded large shipments being made from Queensland. Space for 25,000 cases was made available during February and March of 1958 and the net returns were very much greater than those received on the local market. Apple production in the Granite Belt is expanding very rapidly, and an overseas outlet for early fruit would be a great boon to the industry.

As very promising results in advancing the maturity of Granny Smith apples have been obtained by hormone sprays, it is likely that a greater quantity of early apples will now be available for export. Through the co-operation of exporters it has been possible to carry out all inspections at the packing shed, thus greatly reducing the amount of wharf inspection.

PLANT QUARANTINE.

During the year about 9,000 bundles of plants, 14,000 logs, 136,000 pieces of timber, 160,000 packages of merchandise, 5,500 bags of peanuts, 1,800 bags of beans, 3,000 bales of cotton and 8,000 bundles of bamboo were imported from overseas. Efficient inspection of these imports was made possible through the excellent co-operation of other Government Departments, transport authorities and the various importers. The volume of air traffic continues to expand and frequent inspection of the luggage of passengers is required.

The handling of bulk consignments of peanuts and beans for processing has presented some difficulty, and a considerable amount of experimental work was necessary in order to determine the technique for destroying seed viability without injuring the seed in any other way.

The Plant Quarantine Publicity Campaign, sponsored by the Australian Agricultural Council, is having tangible results. New posters and stickers have been widely distributed throughout Queensland. Through the courtesy of the Queensland Health Education Council, quarantine films were shown at the Royal National Show and have been included in the Council's film library.

SCIENCE BRANCH.

Botany Section: Mr. S. L. Everist, Government Botanist.

Entomology Section: Dr. W. A. McDougall, Chief Entomologist.

Plant Pathology Section: Mr. J. H. Simmonds, Chief Pathologist.

BOTANY SECTION.

In addition to routine identification and advisory services on weeds, grasses, fodder plants, trees, poisonous plants and garden plants, original research proceeded in the fields of systematic botany, weed control and utilisation of edible trees. Botanical exploration in the Cooktown area, on the northern tablelands and in the Belyando River basin revealed a number of new species of *Pandanus*, grasses and rain-forest trees.

A field survey of all methods which have been used to control brigalow was begun and another survey of the behaviour of mulga under various methods of lopping and felling was conducted.

IDENTIFICATION AND ADVISORY WORK.

Dry conditions over most of the State during the first half of the year reduced the number of specimens submitted for identification. Even so, more than 8,000 plants were identified for farmers, graziers, gardeners, schools, Departmental officers and other State and Commonwealth Departments. After the breaking of the drought in most districts, weed specimens were particularly numerous and, somewhat unaccountably, there was also a marked increase in the number of stomach samples submitted for detection of possible poisonous plants.

WEEDS.

Two weeds new to the State were received during the year. They were hook thistle *(Carduus nutans)*, a native of Europe which was found on the northern Darling Downs, and *Tephrosia tinctoria*, a native of southern Asia which was reported from Ingham and Millaa Millaa, in each case in fields sown with imported centro seed.

Two new small areas of skeleton weed *(Chondrilla juncea)* were reported, one from Thane near Warwick, the other from Ballandean. Both are infestations of long standing which had not previously been recognized. A small-scale trial with soil sterilants for treating small infestations of skeleton weed was laid down in the Kingaroy district. Results of this trial will not be available until next summer.

In experiments on green cestrum, 2,4-DB, which looked promising in the earlier stages, failed to give any permanent control, all plants having sprouted from the base and developed normally.

Further observation of lantana treated by aircraft with 2,4-D and 2,4,5-T showed that regrowth was plentiful seven months after treatment, so this method offers no immediate promise of effective control. On this plant, as on green cestrum, 2,4-DB was no better than ordinary 2,4-D.

Jute (*Corchorus olitorius*), a useful fibre plant when grown as a crop, was reported from several parts of coastal Queensland as a serious weed of summer crops, particularly maize and sorghum. It is aggressive and difficult to control.

Mossman burr or Mossman River grass *(Cenchrus echinatus)* appears to be spreading steadily southward and westward. One specimen was received which had come up as an impurity in buffel grass seed. This grass could be a real menace to the wool industry if it became widespread in inland areas.

A booklet "Common Farm and Pasture Weeds" which describes and illustrates more than 100 species was published during the year.

BRIGALOW.

Towards the end of the year, a comprehensive field survey of brigalow was begun. In this survey all methods used to control brigalow are being studied and an attempt is being made to correlate rainfall, temperature and the growth rhythm of the plant with effectiveness of various treatments and the amount of suckering that takes place. There are strong indications that seasonal conditions markedly influence the effectiveness of all methods of brigalow control—ringbarking, pulling and aerial spraying. Best results have been in the wettest seasons.

Further observations on experimental areas treated from aircraft in 1951, 1953, 1954 and 1955 showed little change since the last report, except that the blocks sprayed in 1951 and burnt in 1955 are now virtually clear of brigalow, most of the new suckers noted last year having died.

While aerial spraying of big brigalow trees has been successful, treatment of dense regrowth suckers has given inconsistent results, usually rather poor. Two new trials on this type of brigalow were laid down. In one, a new formulation of 2,4,5-T which showed superior penetration into undergrowth in 1954 was used in comparison with the ordinary butyl ester, at different rates and different volumes. In the other, a helicopter was used to determine whether this machine would give penetration into the lower branches superior to that obtained by spraying with conventional aircraft. Neither trial can be evaluated as yet.

SUSPECTED POISONOUS PLANTS.

From reports received and fragments recovered from stomach contents, notes on more than 50 plants were added to the poisonous plants files. Of these, the most noteworthy were:—

Ellangowan poison bush (*Myoporum deserti*) was found in stomach contents from cattle travelling in the Charleville district, and the same plant was found in ingesta from cattle which died in the Miles district.

Flowers, immature fruits and ripe seeds of linseed *(Linum usitatissimum)* were apparently responsible for the death of 11 milking cows in the Toowoomba district. The material had been fed as a supplementary ration. Analysis of this sample by the Biochemical Branch showed the presence of prussic acid in large amounts.

A field investigation, jointly with officers of the Division of Animal Industry, of properties west of Clermont failed to establish conclusively the cause of persistent mortalities in cattle. Indications are that fuchsia bush *(Eremophila maculata)* is the plant most likely to be involved, but further inspection is needed at a time when deaths are actually taking place.

Morinda reticulata, a plant known to accumulate selenium and to be capable of causing hoof abnormalities in horses, was located in quantity close to Cooktown. All areas previously known were in remote localities and material for experimental work had been difficult to obtain.

MULGA.

During the year drought conditions in the south-west made it necessary for many graziers to cut mulga for feeding their sheep. A visit was made to this region in October-November to inspect areas which had been

observed after the last major drought (1944-1946) and to study methods being used to cut and knock down the trees. This visit confirmed earlier findings on the types of mulga which will grow again after cutting and those which will not.

Trees of the proper type which had been cut correctly in the earlier drought were again available for fodder. Trees which had been incorrectly cut or which had been pushed or pulled over with machinery were mostly dead, but in many areas had been replaced by seedlings which germinated in 1947 on ground left bare by the destruction of the standing mulga. Much of this seedling mulga was large enough to use for feeding sheep, but in areas where there were severe fires in 1950 and 1951 or where grazing with sheep had been excessive it was dead.

In most districts it was found that ample reserves of mulga existed and that the trees themselves were in good condition.

In association with officers of the Division of Animal Industry, much valuable information on palatability and fodder value was collected. This was incorporated in an article published in the *Queensland Agricultural Journal* and issued separately as an advisory leaflet.

The investigations show that, if properly handled, mulga will continue to provide good drought insurance for sheep and cattle in this region for an indefinite period.

SYSTEMATIC BOTANY.

During the year taxonomic work on a number of groups was continued. These included *Acacia, Agonis, Breynia, Homoranthus, Leptospermum, Melaleuca, Pandanus, Plectranthus, Rylstonea, Scleria,* grasses related to *Panicum,* and various genera of the family Convolvulaceae.

Botanical exploration was continued in the rain forest areas of the northern tablelands. From this area a total of 1,300 specimens was collected. Amongst these were one new genus and two new species and one genus and four species previously known only from New Guinea.

Prof. H. St. John, of Hawaii, spent about two weeks in the Cooktown and Cairns district, seeking material of *Pandanus.* He was accompanied by an officer of the Botany Section, who also made extensive general plant collections, including several new species of grasses and other plants.

From the Belyando River basin, west of Clermont, a collection yielded many plants which have not been seen by botanists since last century and some which appear to be new species.

HERBARIUM AND LIBRARY.

Construction of a new fireproof annexe to house the library and the type specimens was almost completed. More than 1,500 type specimens were removed and put into special folders in preparation for transfer to the new building.

Exchanges were continued with other herbaria in Australia and overseas, a total of 758 specimens being received and 91 sent out. In addition, 816 specimens were sent on loan to other institutions for examination by specialists. A total of 5,100 specimens was mounted during the year.

In the library, 135 volumes were bound and 45 new books added, in addition to periodicals.

VISITING BOTANISTS.

During the year visiting botanists who worked in the Herbarium were Mr. J. S. Womersley, New Guinea; Prof. H. St. John, Hawaii; Dr. R. D. Hoogland, Mr. M. Lazarides and Mr. M. Gray of Canberra. Botanists from Indonesia, South Africa and Uganda also visited the Herbarium.

ENTOMOLOGY SECTION.

Drought caused difficulties in combating insect pests, particularly moths and caterpillars. Without the natural checks of the more usual weather conditions pest populations were generally large and widespread, generations overlapped and infestations were experienced over longer periods. Many new locality pest records were made, and in some instances abnormal pest behaviour was exhibited. Sprays and dusts, even when applied more frequently than usual, did not always give the desired protection to crops under hot dry conditions. A few pests, such as fruit flies, which require wet conditions were not active until late summer, and then only in limited areas.

Some fauna, such as kangaroos, wallabies, deer and a few species of birds, were, under drought conditions, more troublesome than usual as nuisances to pastoralists, farmers and orchardists.

Due mostly to the adverse season, the amount of advisory work handled by entomologists was heavy; at the same time investigational activities were continued.

During the year two officers returned to duty after completing assignments abroad, and at present two others are on study tours in the United States of America. Plans to strengthen entomological services in North Queensland and to establish a field station primarily for fauna investigations have been completed.

DECIDUOUS FRUITS.

In the Stanthorpe district the drought did not break until March. Mites were prevalent and difficult to control on the more susceptible apple varieties. An interesting feature was the low population level of European red mite (*Metatetranychus ulmi* Koch). The midsummer flight of codling moth (*Cydia pomonella* (L.)) was earlier than usual, and this pest was particularly active. Heliothis larvae attacked apples before the first cover spray was applied. Infestations of the light-brown apple moth (*Austrotortrix postvittana* (Walk.)) and fruit flies (*Strumeta* species) were negligible. The natural tendency, particularly in an adverse season, to try a large number of new pesticides on a commercial scale was in evidence during the past summer: for orchardists, the overall results of such a course are seldom profitable. Detailed investigations, including screening and large-scale orchard control trials, of mites and other pests were continued, and results indicate some worthwhile changes and alternatives in spray programmes. In the Lockyer Valley during November, *Thrips tabaci* Lind. caused almost complete failure of fruit setting of grapes, and in districts where complete plant dormancy did not occur control of the grape scale (*Eulecanium persicae* (Geoff.)) was difficult.

TROPICAL FRUITS.

Long-term research work, mostly concerning nematodes associated with bananas and pineapples, has been intensified by establishing further field trials and increasing relevant laboratory investigations. Similar work is also being carried out with papaws. Plans have been made for the usual periodic checking of well-established and proven commercial controls of other pests, and of possible changes in pest status.

CITRUS.

Many coastal orchardists were hesitant in applying normal spray programmes under dry conditions and white wax (*Ceroplastes destructor* Newst.) was particularly abundant. In other districts, where only sprays against red scale (*Aonidiella aurantii* (Mask.)) were applied in the hope of controlling several pests, the results were not satisfactory. Another series of orchard trials was completed. The results again demonstrated that oil, despite some horticultural disabilities, is still basic to the successful control of scale pests on citrus. They also supported general field observations that the numerous additives and alternatives, mostly highly toxic, which are suggested from time to time are, by killing parasites, probably doing more harm than good.

From February to June, depending on the ripening of fruit, a State-wide upsurge of fruit-sucking moths (*Othreis* species) occurred. This was the worst for many years, with records of damage from as far west as Birdsville and Camooweal. Concerted research with these pests is difficult, as usually attacks are sudden and sporadic; such work, however, is being organised and expanded.

FRUIT FLIES.

Dry conditions limited worthwhile field investigations. Some ecological studies were completed at Stanthorpe, and more trapping stations were established to obtain further information from inland areas. Appreciable numbers of flies were taken only at stations in the northern parts of the State. One technical and three extension articles were prepared for publication.

TOBACCO.

Early plantings were damaged severely by large populations of leaf miner (*Gnorimoschema operculella* (Zell.)) resulting from a build-up over a suitable autumn and mild winter. Later plantings missed the peak of activity, although all crops suffered some damage, and towards the end of the season the presence of this pest in the plant stems caused further concern. Widespread egglaying by budworm, in keeping with Heliothis attacks experienced in other susceptible crops, was apparent in tobacco in the Burdekin district during late September. The regular spraying to combat leaf miner gave an almost complete kill of hatching Heliothis larvae. The tobacco looper (*Plusia argentifera* Guen.) was not prevalent in the past season. Research covered further screening of insecticides and detailed studies of nematodes in the seedbeds and in the field.

FORESTRY.

Useful data are being obtained from investigations on the bagworm (*Hyalarcta hubneri* Westw.) in plantations at Passchendaele. Results from the cedar shoot borer (*Hypsipyla robusta* Moore) trial at Imbil indicate that a high degree of protection can be obtained; further trials with attention to timing and dosage rates have been planned. The pine bark anobiid (*Ernobius mollis* (L.)) has now been found infesting locally grown timber. As a result of the delay in removing hoop pine logs from plantations during the wet autumn of 1955, an unprecedented number of enquiries concerning damage to timber in houses by the hoop pine jewel beetle (*Prospheres aurantiopictus* (L. & G.)) has been received. The auger beetle (*Bostrychopsis jesuita* (F.)) has been active in most parts of the State damaging ornamentals. Fumigation of imported houses infested by the European house borer (*Hylotrupes bajulus* L.) was commenced in late January by contractors to the State Government and borer-damaged board samples have been examined regularly by an entomologist. Rat populations in forest plantations are now at a low ebb; information on these pests gathered over the past six years is being prepared for publication.

NEMATODES.

In addition to investigations mentioned elsewhere in this report, attention was given to the screening of nematocides; more work has been carried out on problems for which reasonable economic controls have been formulated; and research on systematics, behaviour, distribution and host relationships has been intensified Two technical papers, including a Queensland host list of the *Meloidogyne* species, and four extension articles were prepared for publication. Under dry conditions nematodes were pests of some importance in crops such as potatoes and beans.

PASTURES.

A complex of grass grubs including *Psara licarsisalis* (Walk.), *Spodoptera mauritia* (Boisd.) and *Prodenia litura* (F.) was prevalent from late February to June over an extended geographic range; lawns particularly were damaged severely where spraying, which is usually unnecessary, was not carried out. A few infestations of white grubs were reported from several localities and funnel ants (*Aphaenogaster* species) damaged dairy pastures in north coast districts. Both of these problems, which are concerned with farm management, and the control of seed harvesting ants (numerous species) in pastoral districts are receiving attention.

VEGETABLES.

The potato tuber moth (*Gnorimoschema operculella* (Zell.)) caused losses in tomatoes in the Stanthorpe district; the bean fly (*Melanagromyza phaseoli* (Coq.)), which can be controlled satisfactorily when expected, was present in pest proportions not only as usual in coastal areas but also in districts such as Dalby, Goondiwindi and Stanthorpe; and cabbage pests were difficult to combat. In general, difficulties in controlling pests were parallel with those of growing the crops without adequate soil moisture, and experience during the year indicates the necessity for an approach to vegetable pest control which will cover the various conditions encountered over several seasons, even with the same pest complex in a particular district. Results from screening trials against cabbage pests did not suggest an adequate insecticide control under hot dry conditions.

MISCELLANEOUS FIELD CROPS.

Where control programmes were not implemented in detail, particularly in some coastal areas, spring potatoes were severely damaged in the fields and in storage by the potato tuber moth (*Gnorimoschema operculella* (Zell.)). This pest was not present to any extent during autumn; this indicates that large initial populations in potatoes and other susceptible crops are unlikely in the coming spring. Autumn spraying of potatoes was against jassids (mainly *Austroasca viridigrisea* (Paoli)), which pests were later troublesome in lucerne where soil moisture was inadequate. Improved control programmes for potato and lucerne pests have been published. Trouble with pests was experienced in many other crops. As it was impractical to plant linseed so that flowering would occur before mid-September, which is basic to avoiding Heliothis damage, this pest was particularly destructive. *Heliothis* species continued active until April and attacked sorghum, White French millet, panicum (setaria), maize, gooseberries, beans, peas, white clover, strawberries, lucerne, safflower, many garden plants and other hosts. Cutworms and armyworms were not prevalent, but false wireworm (*Gonocephalum* sp.) and the seed harvesting ant (*Pheidole ampla* Forel) provided good opportunities for field research; sound commercial controls of these pests should be available when next required. Enforced late planting of grain sorghum resulted in loss from sorghum midge (*Contarinia sorghicola* (Coq.)), but on the Darling Downs only those crops that flowered during the stormy period of late March and early April, and were not sprayed with DDT, suffered. In cotton fields thrips were prevalent in the Ayr district during February and March, and in the Callide Valley several crops were invaded in late March by near-mature Heliothis larvae; in some instances DDT treatment was warranted. An intensive investigation of cotton pests is being caried out in the central districts.

MISCELLANEOUS.

The studies on Coccoidea, Dacinae, Agromyzidae, Thysanoptera and Aphididae mentioned in last year's report have been continued and further articles were published during the year. Particular attention is being paid to mites, which are pressing problems in many crops; a number of new records for species has been made, and numerous screenings of miticides have been undertaken. In larger trials, yields of strawberries have been doubled by controlling red spider mite, but unfortunately the organophosphates used are not suitable for commercial use in this crop, where harvesting is more or less continuous over some months. It is expected, however, that this problem will be solved during the coming season. The relationship of the itch mite (*Pyemotes ventricosus* (Newport)) and dermatitis in coal miners was investigated. Other problems given attention included blue oat mite (*Penthaleus major* (Duges)) in peanut fields, earwigs (*Nala lividipes* (Duf.)) in maize plantings, damage to ginger by a cutworm, severe damage to pumpkin seedlings by the pumpkin beetle (*Ceratia hilaris* Boisd.), *Nysius* species damaging peaches, thrips attacking lettuce, and a plague of *Rhyparida limbatipennis* Jac. defoliating mangoes, guavas and other trees.

BEEKEEPING.

In south-eastern Queensland, the principal beekeeping area, the prolonged drought adversely affected honey production. At the date of annual registration (Mar. 31), 1,303 beekeepers were registered, an increase of 22 on the previous registration year. Inspectional work covered 7,790 colonies in 393 apiaries in 29 localities. Nosema disease (*Nosema apis* Zander) was recorded at Kuraby, Camp Hill, Cunnamulla and Atherton; European foulbrood (*Bacillus alvei* White) at Bauple; and paralysis at Bulimba and Kenmore. Heavy adult bee losses, suspected to be caused by insecticides, occurred at Cribb Island, Cleveland, Victoria Point and Mt. Gravatt. Extension services included field visits, field days, press articles, radio talks and a second annual Departmental school comprising lectures at night and daytime visits to selected apiaries.

FAUNA AND FLORA CONSERVATION.

To the end of 1957, 2,733 permits and licenses had been issued under *The Fauna Conservation Act of* 1952, and 624,642 kangaroo, wallaroo and wallaby skins were marketed. These represent increases of 731 and 263,180 on the previous year's figures. Under drought conditions kangaroos particularly were a nuisance in marginal agricultural areas and in pastoral districts. The royalty on kangaroo skins was lifted during the year. Progress in publishing maps and data on fauna sanctuaries throughout Queensland has been made. Information on the marsupial skin industry has been collated for publication. Plans have been implemented to intensify wild duck investigations throughout the State, with sound quantitative information as the objective.

During the year 51 honorary fauna protectors were appointed and 13 prosecutions for breaches of conservation and protection Acts were recorded.

PLANT PATHOLOGY SECTION.

The winter-spring period of 1957 was abnormally dry in southern Queensland, with the result that there was a dearth of most of the common airborne diseases. An exception was found in the powdery mildews. An epidemic of powdery mildew *(Erysiphe graminis)* on canary seed and barley was aggravated by the dry soil conditions which prevented the plants from recovering from the attack. Powdery mildew of the apple was the only disease of note in stone and pome fruit orchards. With moderate rainfalls early in 1958 the situation returned to normal.

CEREALS.

Fusarium crown rot of wheat was the subject of two experiments laid down in July. One was designed to examine further the role of nitrogen, potash and iron in the expression of the disease. The other was to test the relative susceptibility of the standard wheat varieties, which were replicated on a soil which had shown a 30 per cent. incidence of the disease in 1956. On account of the dry season the conspicuous dead-head symptoms were largely absent, although considerable infection was present on the lower portion of the stalk. Final results are not yet available.

Two field trials were established at Bongeen to investigate the effect of nitrogen and trace elements on Rhizoctonia root rot of wheat. Under the dry conditions the disease failed to appear. It was noted, however, that sulphate of ammonia and zinc sulphate gave increases in green weight yields. This was not reflected in grain weights, though these could have been affected by the stress conditions due to lack of water in the later part of the life of the crop.

Leaf blast and head blight *(Piricularia oryzae)* of setarias was again epidemic and caused very severe losses. Its incidence over recent years has been such that the popular Dwarf Panicum variety is now a bad risk. In a variety trial carried out by the Agriculture Branch, Dwarf Panicum proved completely susceptible, while Korean millet *(Setaria italica)* and Nunbank setaria were immune to the disease.

Covered kernel smut of sorghum was the subject of experimental work carried out at Lawes. Captan used as a seed dressing controlled the disease in concentrations ranging from 5 to 20 per cent. and can apparently be substituted for organic mercurials when a non-mercurial is desired. Susceptibility to smut was shown to be affected by a number of factors, such as depth of planting, time of planting and soil nitrogen. Further work on this aspect of the disease is contemplated.

FIELD CROPS.

Peanuts.

Further field trials confirmed that the mercurial seed dressings, while excellent for controlling pre-emergence rot (*Rhizopus arrhizus*), are of no use for the elimination of crown rot *(Aspergillus niger)*. With the organic fungicides such as captan the position is reversed. By using a combined dust containing two-thirds organic mercurial and one-third captan it was possible to retain the advantages of each constituent and obtain high emergence figures followed by a low incidence of crown rot. The mixed seed dressing was subsequently used on a commercial scale by the Peanut Marketing Board with very good results.

Tobacco.

Blue mould of tobacco was investigated in several experiments in North Queensland. In two seedbed screening trials 32 different sprays or combinations were compared. It was established that the best of the copper compounds used was home-made cuprous oxide, while the most efficient organic fungicides were zineb, chloranil and benzyl salicylate. The most interesting outcome of the screening trials was the demonstration of the synergism exhibited in several mixtures of fungicides. This will be investigated in more detail in the coming season.

The four most promising fungicides were used again in a field trial employing early and late timing scehdules and priming plus a late spray. The most successful treatments in preventing foliage infection were, in order of merit, benzyl salicylate, zineb, and home-made cuprous oxide. The lastmentioned was best in preventing vascular infection. The examination for stem infection established the fact that this type of symptom is not restricted to plants infected early in life. There were the same number of plants exhibiting this trouble among those which were showing leaf symptoms in early October as among those first developing such symptoms in mid-November.

In a timing-of-benzol experiment, seedlings in beds receiving benzol every night were stunted and damaged to such an extent that they were useless for planting out.

The phenomenon of acquired resistance was met with once again. It is obvious from several seasons' experimental work and field observation that an early mild infection with blue mould will condition a plant so that it is less severely affected by subsequent epidemic outbreaks. This phenomenon is to be investigated in more detail in the coming season.

Ginger.

For the control of ginger rhizome rot *(Fusarium oxysporum)*, an organic mercurial proved much superior to captan as a seed-piece treatment. Curing without fungicidal treatment was ineffective. In a subsequent experiment the relative efficiencies of a number of different mercurials were ascertained.

FRUIT.

Banana.

Field work on the control of common leaf spot *(Mycosphaerella musicola)* has been brought to a close. In the final experiment it was shown that copper oxychloride and zineb could be substituted for Bordeaux mixture without loss of efficiency. The supplements white oil and malachite green are, however, essential in all cases. Laboratory work is being directed to ascertaining the particular part played by these supplements.

The Bordeaux-white oil-malachite green formulation has been used on a commercial scale by a number of banana growers using various spray outfits. The control of leaf spot achieved by efficient operation is spectacular, almost complete elimination of the disease being obtained in comparison with heavy infection in unsprayed plantations in the same locality.

Pineapple.

Investigations have failed to produce evidence that a fungus is responsible for isolated wilt in pineapples, Extensive root and soil isolations using various techniques have not revealed a likely causal organism and it is now assumed that a mycological factor is not involved in this particular type of wilt.

Further work has been carried out with fruitlet core rot of pineapples. Two species of *Fusarium* and three of *Penicillium* have been isolated from infected fruit and the pathogenicity of these organisms has been shown both by ripe-fruit inoculations and by inoculation of green fruit on the plant. Field inoculation work has further shown that an injury is necessary before these organisms can enter and rot the flesh of the fruit. Increasing the inoculum load in applying spore suspensions and increasing humidity by covering the fruit with plastic bags do not affect the incidence of the disease in the absence of injuries.

Strawberries.

A "yellows" virus disease, of a type normally not in evidence, was prevalent in Phenomenal strawberries during the 1957 season and forced the temporary suspension of the Strawberry Runner Approval Scheme. The symptoms of this disease are not as severe as those produced by the well-known severe yellow edge, but affected plants were stunted and fruit production and runner production were reduced. Selections of apparently healthy plants have been made and the material multiplied as a future source of desirable planting material.

Passion Vine.

A passion fruit trial in which vines inoculated with mild strains of the Queensland woodiness virus were compared with vines inoculated with the normal severe strain was harvested in November. The results were remarkably clear-cut and demonstrated a much higher yield and better quality of fruit from the vines carrying the mild strain. This method of reducing the loss due to the woodiness disease may be a practical one if grafting of vines for Fusarium wilt control becomes popular.

VEGETABLES.

Tomatoes.

Work in tomatoes has been directed mainly towards overcoming the leaf shrivel virus problem. In the glasshouse, transfers to indicator plants to correlate field symptoms and the retesting of survivors of the previous season's screening tests were carried out. No variety has shown marked resistance, nor have hybrids with *Lycopersicon peruvianum*. Prospects at the moment are not bright.

A tomato disease resistance trial at Kamerunga was completed in September. Some hybrids with Manalucie showed considerable promise and were highly resistant to leaf mould (*Cladosporium fulvum*), one of the most important diseases in North Queensland. An unusual occurrence was an extremely virulent outbreak of leaf and fruit spot caused by *Corynespora cassiicola*, a parasite which is normally restricted to the papaw.

MISCELLANEOUS.

Turf.

Dollar spot (*Sclerotinia homeocarpa*) may cause considerable inconvenience to bowling and golf clubs in southern Queensland from March to November. In an experiment on two greens of blue couch (*Digitaria didactyla*) it was demonstrated that adequate control can be obtained by fortnightly spraying with an organic mercurial, phenylaminocadmiumdelactate, T.M.T.D., captan or a mixture of mercurous and mercuric chlorides. The captan proved mildly phytotoxic and the mixed chlorides severely so.

Forestry.

Serious losses of 15-20-year-old *Pinus taeda* and *P. elliottii* trees occurred during drought conditions in some compartments of Beerburrum Forestry Plantation. The damage could not be attributed solely to drought and it is likely that root rotting in previous wet seasons was a contributing cause. *Phytophthora cinnamomi* was isolated from soil in the vicinity of affected trees and investigations are proceeding to check the pathogenicity of this organism to the various species of *Pinus* grown in Queensland. In some other districts death of hoop pine was apparently related directly to drought.

SOIL MICROBIOLOGY.

The increased demand for legume inoculum did not materialise last year to the extent expected. This was due to the severe drought experienced during the spring and early summer months. New inoculum distribution centres were opened at Cooroy, Atherton and Kingaroy to meet the convenience of local farmers.

Experimental work on the tropical legume centro (*Centrosema pubescens*) has demonstrated the marked specificity of the bacterial requirements of this legume. Of 23 isolates from tropical legumes of other genera, only one produced an effective association with centro. It was shown, however, that bacteria effective on *C. plumieri* and those effective on *C. pubescens* were mutually effective on the other of the pair.

Detailed studies of 21 legume bacteria nodulating *C. pubescens* naturally in various parts of Queensland showed these to vary in their effectiveness. A genetic factor in nodulation has also been proved. A number of plants in commercial seed lots are inherently very poor or late nodulating with some bacterial strains. This is reflected in poor seedling growth.

Examination of field plots of centro have shown a marked seasonal periodicity in nodulation and nodule function. This is related to the general growth phases of the plant. Severe cutting of plots induces the sloughing of the majority of nodules and approximately two-thirds of the root system. Studies of this type will give data for more efficient handling of the legume for establishment and growth of associated plant species.

Further temperature studies on the legume bacteria indicate the importance of soil temperature in establishment. It has been shown that soil temperatures reached in the tropics can be considerably in excess of the maximum temperature for growth of the legume bacteria and that these temperatures are maintained for a long enough period to kill Rhizobium inoculated to the seed and to lower considerably, and in some cases eliminate, legume bacteria added to soil at an initial concentration of 1×10^6 organisms per gram of soil. The effect of high soil temperature can be lessened by selection of Rhizobial strain, by level of inoculum and by ground shading by living plants or trash.

CHEMICAL LABORATORY.

Mr. C. R. von Stieglitz, Agricultural Chemist.

The severe drought of 1957-58, which had such an adverse effect on agriculture generally and on many of the field experiments which were being carried out by the Department at that time, inevitably had repercussions on the work of the Chemical Laboratory. This was reflected particularly in the number and quality of water samples submitted for analysis.

With the failure of surface water on many properties, farmers and graziers were frequently faced with the difficult problem of making the best use of bore water which they knew to be of doubtful quality. The chemists were able to help here by analysing fresh samples and suggesting remedial measures whenever possible. This service to producers proved to be popular, as is shown by the fact that during the November-January period 810 samples of water were analysed and assessed as to their suitability for irrigation and/or stock.

Other sections of Branch work were also affected by the drought. The dearth of protein-rich supplements such as meatmeal caused a decline in the quality of stock foods and substitutes were sought. Here again the Chemical Laboratory staff were able to help by analysing various grains, etc., for their protein content.

One product on which the drought had a beneficial effect, so far as quality is concerned, was wheat, and the harvest contained an appreciably higher percentage of protein than normal.

Finally, the drought imposed exceptional conditions on investigations at the Coolum Field Station, as during 1957 the year's rainfall was only 35 in., compared with the annual average of 69 in.

The main results of the year's work are given under the headings of the various Sections constituting the Branch.

PLANT NUTRITION SECTION.

Soil Survey.

Survey work continued in the Mareeba-Dimbulah district and field work on the areas known as Right Bank Walsh, Walkamin-Mareeba and Atherton Creek was completed.

The Right Bank Walsh survey covered approximately 6,000 acres. The soils, as usual, were grouped according to their suggested land use and mapped as individual soil types within the land use group. Of the 6,000 acres, 680 are considered suitable for perennial and annual crops, including tobacco, and 215 suitable only for annual crops, including tobacco, provided special irrigation techniques are employed. Approximately 900 acres could probably be used for pastures, but experimental work would be necessary to decide this. The remainder of the country is unsuitable for irrigation, mainly because of topography.

The Walkamin-Mareeba area covers 12,000 acres. A soil map of 10,000 acres of this has been prepared, the remainder being broken country unsuitable for agriculture. The majority of the soil types of this area are derived from basaltic material. Approximately 5,500 acres are suitable for perennial and annual crops, but doubtful for tobacco because of basaltic origin. Some 2,300 acres have soils suitable for agriculture, but are covered with large boulders. However, with modern clearing equipment it may be possible to remove the stones economically and so bring the land under cultivation.

Chemical analysis of one of the major soil types in this area, the Walkamin clay loam, has shown that apart from the surface two inches of soil a most undesirable ratio of exchangeable magnesium to exchangeable calcium occurs; in addition, exchangeable potassium is low. Deficiencies of both calcium and potassium were suspected and pot experiments were initiated to test this lead, using the sub-surface layer. The test plant initially was a clover; later, dwarf sunflower was used. Highly significant responses to calcium and potassium were obtained. The former was applied as gypsum and the latter as muriate of potash. Following the pot trials, a field trial with peanuts was established to study the effect of additions of both calcium and potassium. Results of yields are not yet to hand, but observation of the growth of plants indicates that a marked response to both calcium and potassium will be obtained.

Analytical figures for a typical profile of this soil type are given in Table 1.

TABLE 1.

Analysis of Walkamin Clay Loam.

Depth.	Soil pH liquid 1-2·5.	Avail. P_2O_5*	Exchangeable Cations.				Total.
			Ca++	Mg++	Na+	K+	
In.	%	%	%	%	%	%	%
0–2	6·2	23	8·25	5·54	0·50	0·47	14·76
2–10	5·6	18	0·75	3·50	0·94	0·07	8·26
10–18	5·9	11	0·38	5·43	0·84	0·08	6·73
18–24	6·0	18	0·13	5·21	1·02	0·09	6·45
24–38	6·1	11	0·88	7·89	1·44	0·06	10·27
38–48	6·2	14	3·50	30·19	5·64	0·16	39·49

* N/100 H_2SO_4 extract, soil/liquid 1–200; 16 hours shaking.

The results of the above study are important, as this soil type occupies a large area of land near Mareeba which will be available for cultivation when water from the Tinaroo Dam is available for irrigation.

The Atherton Creek area consists of 4,500 acres of very broken country containing only 1,400 acres of arable land. Because of its unsuitable topography, the land in this section would be difficult to irrigate successfully.

No detailed soil survey work was undertaken in the Burdekin district during the year, but a number of inspections of farms were made to check the boundaries of tobacco soils, and a general appraisement of soils was made in the Clare section.

In addition to the field work analytical determinations to determine the chemical and physical properties of the soils are being carried out.

Reconnaissance Soil Surveys.

Reports concerning two large areas which had been surveyed in 1956-57 were made during the year. These areas were in the Dawson Valley and St. George districts. The former covered an area of 486,000 acres and the latter 147,000 acres. Soil maps of these at the Great Soil Group level were compiled.

In addition, an investigation of an area of land near Warrill Creek to assess its possibilities for production under irrigation conditions was made. This showed that 16,000 acres of land already under cultivation would be suitable for irrigation.

Soil Salinity Investigations.

Investigations into the problem of reclaiming a coastal saline soil near Currumbin and examination of the salt tolerance there of different pasture species have been made over the past four years. Results have been encouraging and are summarised below.

The soil was originally strongly acid (pH 5.3 at 0–3 in., 5.2 at 3–8 in.) and contained a level of salt which, expressed as chlorides, varied from 0.35 to 0.67 per cent. As the soil had been subject to tidal flooding, a flood-gate was installed in May, 1954. This had the effect of reducing the chloride content below 0.36 per cent. in all but one spot. Following drainage, the soil chloride figures decreased appreciably and in November, 1955, land was prepared for a field trial. This was planted in December of the same year. In addition to providing drains to facilitate removal of the surface water, hilling-up of the plant rows was practised. Following the heavy rain which fell late in the summer of 1958, the chloride content of the soil dropped considerably. Kikuyu, para and Rhodes grasses have shown high salt tolerance.

In an endeavour to improve the physical condition of the soil and to encourage water penetration and leaching out of the salt, an application of sugar-mill mud was made to further areas at the rates of 25 and 50 tons per acre respectively. The mud had a very beneficial effect on plant growth. Para, kikuyu and paspalum grasses are now well established on the hills between furrows and are spreading into the furrows. It is hoped that with improvements in the flood-gate system and further drainage, this land can be reclaimed successfully and that the results will have application to many other areas of coastal lowlands.

Fertilizer Trials.

Co-operative work with the Agriculture and Horticulture Branches was undertaken with linseed, wheat and various small crops.

Linseed and Wheat.—Experiments in connection with zinc deficiency in linseed were continued to gain data additional to those summarised in the last annual report, but drought conditions at Brookstead were so severe that the trial had to be abandoned. It is now being repeated. The urea trial with wheat was repeated and nitrates in the soil determined at different depths to 36 in. The highest value obtained for nitrates was 24 p.p.m. in soil from the treatment 2 cwt. urea at sowing.

Small Crop Trials.—Following on the results from the tomato trial in 1956-57, which showed that phosphate applications over a number of years resulted in an accumulation of phosphorus in the surface soil, a number of samples were obtained from soils in the Redlands district which had been heavily fertilized in recent years, to determine the movement and availability of the applied phosphorus. It was shown that a large proportion of this remained in the available form and that the only movement of phosphorus within the soil was associated with the depth of cultivation.

A trial with strawberries, designed to study the movement of applied soluble fertilizers on a red loam, is under way. One with lettuce, to assess the effect of lime and trace elements on the production of the "grey podzolic soils" of the Redlands district, is also in progress. In the strawberry trial, results to date show that the applied sulphate of ammonia is converted rapidly to nitrates and these are removed rapidly from the surface soil following rain or irrigation. In the experiment in which lettuce is being used as the indicator plant, germination was best and growth most even on those plots to which lime was added. The crop has not yet been harvested.

Pot Experiments with Brigalow Soils.—In order to study the reason for lack of response of wheat to applications of superphosphate on some brigalow soils, two different soil types were selected for pot trials, one with fair available phosphate and the other containing low amounts. Wheat was planted in pots and a nitrogen/phosphorus trial conducted. The results provide a good lead for future field experiments. It was shown that the low-phosphate soil responded significantly to phosphorus applications only when adequate nitrogen was also applied, while the soil with fair phosphorus did not respond to phosphorus but did to nitrogen.

Water Analyses.

As mentioned earlier, a large number of waters were analysed and their suitability for irrigation and/or stock assessed. Many bores which had previously been discarded as unsuitable were again sampled and tested in the hope that an improvement might have taken place. This rarely happened, but by analysing them anew it was possible in some cases to suggest remedial action. Interesting cases of chloride injury to citrus

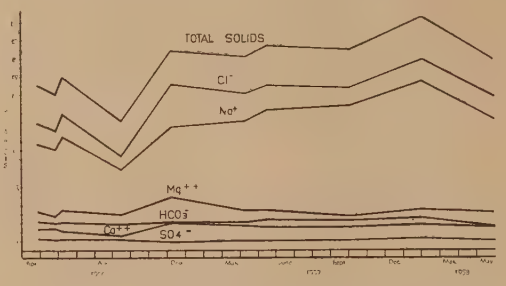


Plate 1.—Graph Showing Average Composition of Waters Analysed Between April 1956 and May 1958.

trees (which are sensitive to chloride uptake and accumulation in the leaves) occurred in one locality due to the use of water which would normally be considered of satisfactory quality for irrigation. Because of the dry weather the chloride content of this water was a little higher than normal, and this, combined with the high evaporation rate at time of application, resulted in chloride accumulation in the soil and in the leaves of the plant. This caused severe defoliation. The severity was lessened appreciably by giving less frequent but heavier applications of water.

Wallum Investigations.

General.—During the year 1957 a rainfall of 35 in. was received at the Coolum Field Station. This is the lowest annual rainfall since recording began at Coolum in 1924. In April, 1958, 24.36 in. was received, this being the highest monthly total for the Field Station since 1953. Although 1957-58 was a very dry year overall, good falls of rain were received in July, 1957, and these, accompanied by warm temperatures, prolonged the growth period of most of the summer grasses. However, to offset this, some light frosts which occurred in late August and early September caused considerable damage to kudzu, centro, stylo, *Paspalum secans* and para grass. Pineapples also suffered some cold damage. Conditions during September and October were too dry to enable the usual summer pasture trials to be planted.

Following some useful rain in November, growth was maintained by para, buffel, green panic and Rhodes grasses in the grazing areas, although at one stage green panic began to wilt on the drier portions of the field. However, despite the extremely dry weather in 1957 it was possible to maintain four head of cattle in fairly good condition on approximately 10 acres of pasture throughout the year. These results are promising and the next logical step is to establish replicated animal-pasture trials.

During the dry weather in 1957 there was considerable loss of lucerne on both heath and forest country. Lucerne on these acid sandy soils develops a very shallow rooting system which does not penetrate below the applied lime and fertilizer. Consequently the crop fails to survive under very wet or very dry conditions.

Ensilage Project.—Early in December an ensilage project was undertaken in which a tower silo 7ft. 6in. high and 6 ft. in diameter, of steel mesh lined with hessian paper, was constructed and filled with chaffed cowcane. It is planned to feed the ensilage to stock on the Station late in the winter as a supplement to pastures.

Experiments on Forest Country.—In addition to the work on the heath sands, a small area of eucalypt forest country was cleared, cultivated and planted to experimental plots of bananas, citrus and pineapples, all of which are showing promise. A few pilot plots of grasses and legumes which have grown well on the heath sands have been established for observation on the forest soil.

Drainage Work.—Advantage was taken of the dry weather during 1957 to carry out maintenance work on existing drains and to construct new ones. Early in October a grader was hired from the local council and two V-shaped drains, 50 and 55 chains long respectively, were excavated to a depth of approximately 2 ft. in 18¾ hours. Establishment of these two drains will make available for development an area of 50 acres of heath land, away from the influence of coastal winds. The continued wet weather in 1958 has enabled an assessment to be made of the effectiveness of the main drains in this new heath area and it is pleasing to be able to report that they have been found to be highly satisfactory even under excessively wet conditions.

Soil Investigations.—At the end of January, advantage was taken of the dry conditions to examine tea-tree swamp soil profiles. These fall into the great soil group of "acid swamp" soils. They were found to vary considerably in morphology, some showing evidence of former buried profiles. Most contain high amounts of organic matter in the surface horizon and once satisfactorily drained should grow good crops when fertilized correctly.

GENERAL ANALYTICAL SECTION.

The general analytical section examined 1,365 samples during the year, composed as follows:—

Grasses and legumes	580
Stock foods	467
Pest destroyers	100
Fertilizers and limestones	98
Veterinary medicines	31
Silage	13
Maize	23
Seeds	36
Miscellaneous	17

A large number were samples submitted by the Standards Branch to check the quality of marketed goods which have to comply with the requirements of the Agricultural Standards Act. The quality of fungicides, pest destroyers and veterinary medicines so submitted was high, all samples conforming to the regulations. A number of mixed fertilizers, however, were found to be below guarantee in one constituent, but were then usually above guarantee in one of the others, thus indicating that a faulty mixing technique had been employed.

The most serious discrepancies were found to be in the composition of stock foods and usually in the important ingredient of protein. The position was aggravated by the scarcity of high-protein animal concentrates during the drought period. Other protein-rich substitutes were sought. The Section was able to help here by analysing various grains and seeds for their protein content. The grains examined varied in protein content from 8 to 13 per cent. and the seeds of legumes from 20 to 25 per cent.

Methods Research.

Research work on suitable methods for analysing the many new organic compounds used as fungicides and pest destroyers is proceeding continuously. In these tests, full use is made of the modern chromatographic separation methods.

In addition to the samples analysed for conformity with the Agricultural Standards Act, numerous grasses, legumes and grass-legume mixtures were examined in connection with pasture research.

Agrostological research work has expanded greatly during recent years and this in its turn means extra work for the section, as a check of the nutritive value of the pastures must be made from time to time. Many samples were from the experimental plots at "Brian Pastures" and some from the Coolum Field Station.

A large number of pasture samples were analysed in connection with a co-operative study with a chemicals company in which the effect of nitrogenous fertilizers on pastures were assessed.

Miscellaneous.

Several interesting cases came to the notice of the section. One was a sample of dust collected from the filters of one of the peanut silos following treatment of seed peanuts with a commercial organic mercurial normally containing 1.5 per cent. mercury. The dust from the filters contained 1.2 per cent. mercury, and its recovery might be worthy of consideration.

Another case was concerned with the ineffective ripening of marketed bananas. The bananas in question turned black and were rubbery in texture. This was found to be associated with the presence of arsenic from a spray applied to the fruit at a late stage of maturity.

CEREAL SECTION.

An appreciable expansion in cereal work took place during the year. This was caused firstly by the expanded programme of wheat quality investigations undertaken by the Agriculture and Regional Experiment Station Branches, and secondly by research work on wheat proteins and starches within the section.

The number and composition of the samples examined were as follows:—

Full-scale quality testing	262
Protein, moisture and bushel weight only	740

Annual Wheat Quality Survey.

For the annual wheat quality survey conducted by the State Wheat Board, 443 samples were examined for protein, moisture and bushel weight. These samples, which refer to the 1956 harvest, averaged only 11.5 per cent. protein. The protein figures for wheats from the 1957 harvest are not yet complete, but will be of the order of 13 per cent.

Royal Agricultural Society Competition.

Due to the high standard of entries in the 1957 Champion Bushel of Wheat Competition held by the Royal Agricultural Society, Toowoomba, it was necessary to mill 90 samples of the 122 entries. Baking tests and farinograph recordings were made on all of these and extensographs on 32 of them. The average protein content of all entries was 13 per cent., compared with 11.7 per cent. for the previous year. Bushel weights averaged 65.6 lb. The highest recorded protein was 17.4 per cent. (Charter) and the lowest 9.7 per cent. (Gabo). The winning variety (Charter) came from Yandilla and yielded 9 bags per acre. The reserve champion was Spica. Both champion and reserve champion samples exhibited high strength, good extensibility and high protein.

Wheat Board Composite Sample.

A representative sample of bagged wheat (1957 harvest) compounded in the laboratory from individual samples supplied by the State Wheat Board gave a protein content of 13.9 per cent., and a bushel weight of 64¾ lb. The baking quality was good and the flour medium strong.

Such a sample is a good indication of the overall quality of the 1957 harvest.

Plant Breeders' Samples.

Samples from the 1956 harvest were not completed until the 1957-58 financial year. Of the 26 samples received, protein values were between 13 and 14.2 per cent., which was very pleasing for a year in which values generally were low. Good samples were Spica 5500, LSFM 5581, $TU_3TT5332$ and $SFM_4MENT5572$.

Results are not yet complete for the 35 samples from the 1957 harvest, but protein values are high (of the order of 15 per cent.), the minimum value recorded to date being 13.7 per cent.

Co-operative Work with Other Branches.

Co-operative work with the Agriculture and Regional Experiment Stations Branches was mainly in connection with a check on wheat grain quality in the variety and fertilizer field trials. It is interesting to note that although applications of urea to wheat in several trials resulted in significant yield increases, it was only when the urea was applied at flowering time in the form of a spray that any appreciable increase in flour quality was obtained. The soils on which these experiments were carried out have exceptionally high quantities of available phosphorus, and it may well be that the protein quality of wheat grown on them will not be increased appreciably until a much higher field application of nitrogen is given.

Research Work.

Research work on the quality of the well-known varieties Spica and Festival was undertaken during the year. Several interesting facts have already emerged. Harvesting at different stages of maturity was carried out and the percentage of protein and moisture at the time of harvesting was recorded for both varieties. The figures are shown in Table 1.

TABLE 1.

Quality of Spica and Festival Wheats.

Variety.	Harvest Date.	Protein Content.	Yields.	Moisture at Harvest.
		%	bus./ac.	%
Spica (1)	15th November, 1957	14·7	..	52·6
Spica (2)	19th November, 1957	14·9	..	13·6
Spica (3)	21st November, 1957	14·3	27·5	11·4 (mature)
Festival (4)	15th November, 1957	14·1	..	41·5
Festival (5)	19th November, 1957	13·8	..	19·3
Festival (6)	21st November, 1957	14·2	25·6	11·3 (mature)

(1) Flour strong, well balanced, very good baking quality.
(2) Flour stronger than (1), well balanced, very good baking quality.
(3) Flour stronger than (2), well balanced, very good baking quality.
All the above samples were very good, and a marked increase in strength was noted from (1) to (3). Conditions from flowering to harvest were hot and dry.
(4) Flour medium strong, well balanced, good baking quality.
(5) Flour medium strong, well balanced, fair baking quality.
(6) Flour medium strong, balance toughening, fair baking quality.

The strength of all these samples was about the same and tended to toughness. Compared with Spica at equivalent protein levels, a marked difference was in evidence. Spica continued to increase in quality until harvest time, while Festival was at its maximum when harvested at 41.5 per cent. moisture.

The following chemical investigations have been carried out on the whole wheat and on the flours, bran and pollard obtained from these two varieties:—starch, true protein nitrogen, non-protein nitrogen, glutenin, gliadin, total phosphorus, inorganic phosphorus, lipoids and lipoid phosphorus. The following trends were noted.

The starch in the Festival flour remained fairly constant for the three samples, while that of the Spica flour decreased with increasing maturity. This decrease was not due to increasing protein. Non-protein nitrogen was constant for all flours, while albuminoids were lower in Spica and higher in Festival. Glutenin and gliadin figures were fairly constant, allowing for differences in total protein content. Total phosphorus (flour) remained constant in Festival, but decreased in Spica with increasing maturity. Water-soluble phosphorus showed the same trend. Lipoids were higher in Festival than in Spica and decreased with increasing maturity in both cases. Lipoid phosphorus showed little variation.

Research work on protein quality will be continued in 1958-59.

DIVISION OF ANIMAL INDUSTRY: BRANCH REPORTS.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.

The year 1957-58 was, in general, a very poor year for primary producers in the pastoral areas. No general monsoon rain occurred in the early part of 1957 and many stock-owners were forced to move stock to agistment country during the winter.

There was an almost complete failure of spring and early summer rains except on the north coast. In most areas the 1957 rainfall was only one-third to half the normal precipitation. In North Queensland the coastal area was good throughout, while the north-west had scattered losses and fewer fat cattle than usual available early in the season.

By the end of October, the coastal strip from Gympie to Bundaberg was drought-stricken, with losses of dairy stock up to 30 per cent. in some areas.

In inland areas, cattle losses were not at that time heavy and were confined to breeders. These varied from 1 per cent. in the Toowoomba-Warwick area to 4 per cent. at St. George. The only sheep losses at this time were in ewes in the Cunnamulla-Thargomindah area and St. George. Some losses were up to 35 per cent. The lamb drop has been very light.

Good general rain early in November improved the general position, except in the south-west and Maranoa, but hot, dry weather quickly burnt off the new feed.

This pattern was continued during the next few months, rains in January and March, although very beneficial, being insufficient to break the drought completely and put the country in good condition for the winter.

In general, good conditions prevailed by the end of the year in the north, north-west and coastal areas. Parts of the Burnett, the Darling Downs and western Downs were becoming very dry but were relieved by good rain in June.

No relief was obtained in the south-west below Cunnamulla. No general rain has fallen in this area since 1956; many of the sheep have been removed to agistment and the remainder are living on top-feed, which is becoming scarce.

At the end of June, stock routes in the Channel country, except up the Diamantina, were closed to other than motor transport.

Losses in dairy cattle, although severe in most coastal areas, would have been much heavier but for the development of fodder reserves.

It was noted in some areas that after the experience of the disastrous grass fires of 1951 rural fire boards operated much more effectively in minimising losses of feed in dry weather.

On the Darling Downs feeding off of winter cereal crops that failed for grain, and in western areas making top-feed available, did much to prevent losses.

Dairy production was heavily depressed and did not commence to rise until January and in some areas (e.g., Millmerran) until March.

STOCK MOVEMENTS.

Interstate stock movements are set out in Table 1.

TABLE 1.

INTERSTATE STOCK MOVEMENTS, 1957–58.

——	Cattle.	Sheep.	Swine.	Others.
Entered from Nthn. Territory	68,680	..	..	..
Entered from New South Wales	33,463	471,630	576	498
Removed to Northern Territory	1,680	..	..	..
Removed to New South Wales	336,608	298,419	65,449	135

CATTLE DISEASES.

Tuberculosis.

A number of tuberculin testing areas became vacant during the year, largely owing to practitioners taking up other avenues of employment. These include small-animal practice, University employment and services for the Philippine cattle trade. Some practitioners moved to other States. Nine areas have been vacated and three filled. There are now 38 approved veterinary surgeons holding contracts for testing in the State.

There has been no increase in the number of dairy cattle under test. The number of tests performed has been reduced partly by the institution of biennial tests in further areas where eradication is proceeding satisfactorily, but more particularly on account of the bad seasonal conditions prevailing throughout most of the year. It is obviously undesirable to subject weak cattle to extra handling. During the year 296,014 tests were carried out and 351 reactors removed, compared with 509,850 tests and 1,258 reactors detected in 1956-57. Details are given in Table 2.

TABLE 2.

DAIRY CATTLE TESTED FOR TUBERCULOSIS, 1957–58.

Division.	No. of Herds	Cattle Tested.	No. of Reactors.	Percentage of Reactors.
Brisbane Division—				
Southport-South	64	5,140	13	0·25
Coomera-Southport ..	54	5,303	13	0·25
Beenleigh-North	107	2,926	7	0·24
North Brisbane and Petrie	73	4,045	19	0·47
Moggill-Kenmore	37	1,446	1	0·07
Samford	34	1,651	..	..
Beenleigh-Beaudesert ..	93	6,045	3	0·05
Beaudesert-Border ..	83	9,463	44	0·46
Dayboro	69	5,358	9	0·17
Dayboro-Mount Mee ..	12	949	3	0·32
Woodford	28	2,581	4	0·15
Caboolture	10	698	8	1·15
Southern Ipswich	228	10,956	5	0·05
Chambers Flat	14	487	6	1·23
Maroochy Shire	197	9,744	25	0·26
North Ipswich	237	10,555	9	0·09
Boonah	241	12,220	23	0·19
Maleny-Landsborough ..	143	10,679	..	..
Esk	3	246	1	0·41
Laidley-Lowood	136	6,476	29	0·45
Division Totals ..	1,863	106,968	222	0·21
Cairns Division	355	19,350	5	0·03
Townsville Division	106	5,380	..	..
Rockhampton Division ..	138	8,526	6	0·07
Burnett Division	1,408	85,185	83	0·10
Toowoomba Division	1,175	70,605	35	0·05
Brisbane Division	1,863	106,968	222	0·21
Grand Totals ..	5,045	296,014	351	0·12

Testing of beef cattle on a voluntary basis was continued. All lesions found at meatworks examinations are recorded and referred to local officers for follow-up work where applicable. Details are given in Table 3.

TABLE 3.

BEEF CATTLE TESTED FOR TUBERCULOSIS, 1957-58.

——	Herds.	No. of Animals.	No. of Reactors.	Percentage of Reactors.
Roma ..	4	2,608	141	5
Rockhampton	1	403	Nil	..
Townsville ..	14	6,110	24	0·3

In addition to testing for disease control, public health (warm milk vendors) and certified herds, urgent testing of dairy cattle in temporarily vacant contract areas has been carried out by Departmental veterinary officers, details being as follows:—

Roma ..	597 cattle	.. 3 reactors
Cairns ..	600 cattle	.. ..
Maryborough	1,500 cattle	.. ..
Brisbane ..	704 cattle	.. 8 reactors
Townsville	1,628 cattle	.. 14 reactors

Pleuropneumonia.

Very little active pleuropneumonia was encountered during the year. Only one property was quarantined. This was following the introduction of a mob from the Northern Territory which had been involved in an outbreak in that State. Quarantine restrictions were raised from 11 properties. At present there are no properties in the State quarantined for this disease. One mob of fats in which an outbreak occurred was vaccinated, held for a time and then allowed to go in for slaughter. Active cases, however, have been noted on several occasions in unvaccinated fats at coastal meatworks.

Contagious pleuropneumonia extension services were continued, employing four experienced officers full time. Since the service commenced in 1954, 796 properties have been visited, some three or four times. Two hundred-and-ninety properties were visited for the first time during the year and progress reports submitted on 340 properties revisited. These were based on the amount of inoculation being carried out in addition to statutory provisions affecting travelling cattle. Inoculation of either the whole herd, weaners, breeders or calf drop is regarded as satisfactory co-operation, depending on circumstances. In the area approximately three-quarters of a million head were inoculated.

The reporting of meatworks lesions is continuing. Some properties showed a notable decline in percentage of marketed stock showing lesions.

Abortion and Sterility.

The use of Strain 19 vaccination for brucellosis showed a slight decline. Approximately 45,000 calves were reported vaccinated, of which approximately 5,000 were vaccinated by Departmental officers. The reduction in numbers would appear to be associated with drought conditions. Approximately the same number of herds were involved as in the previous year's record vaccinations.

Adult vaccination with Strain 19 is now permitted in this State but it is considered that it should only be used in selected herds where there is considerable risk of an abortion storm occurring. Undesirable side-effects have already been reported in several herds and adult vaccination is not recommended as a routine practice.

Routine blood testing, mainly as a diagnostic measure, was continued. *Brucella abortus* was recovered from several aborted foetuses.

Use of the mucus agglutination tests has confirmed that vibriosis is extremely widespread. It is present in all dairying districts and it has been detected in several beef herds where there was an infertility problem. An artificial insemination programme has been launched as a control measure on one beef property.

Treatment with combinations of penicillin, streptomycin and sulphadimidine, together with bull management where possible, has given reasonable control of the disease, but until there is great improvement in bull management, fencing, service records and own breeding replacement, venereal diseases may be expected to take an annual toll by lowered conception rates.

The development of artificial insemination should assist greatly in the control of infertility, especially that due to vibriosis.

Leptospirosis.

Acute sickness in cows and calves due to leptospirosis was considerably lower than in previous years. This is in keeping with the epidemiology of the disease, associating it with wet conditions. Only on the Atherton Tablelands, where the disease has been recognised only comparatively recently, were serious outbreaks encountered.

A long-term field experiment is being conducted at Ayr to assess the influence of *L. hyos* as a cause of abortion. Samples of the whole herd are submitted every four months in an attempt to establish any correlation between changes in titre and the incidence of abortion and stillbirths.

Mineral Deficiency.

Routine blood and liver analyses were carried out for the determination of phosphorus and copper levels as a diagnostic measure.

A phosphometer extension project was set up in the South Burnett on a property where inorganic blood phosphate in milking cows ranged from 1 to 2 mg. per 100 ml. Work was discontinued owing to the sale of the property, but in the short time of operation it was noted that the herd had improved greatly in condition.

During the late winter and autumn of 1957, 28 cases of severe anaemia in dairy cattle were seen in eight herds in a circumscribed area of the Kingaroy district. The syndrome was associated with extremely low blood phosphate levels: approximately 25 per cent. of 70 blood samples taken in affected herds were below 1 mg. P/100 ml. The disease occurred in the area where post-parturient haemoglobinuria has been seen in previous years. Most cases of the anaemia syndrome were also post-parturient but a few occurred in animals at all stages of pregnancy. In addition to symptoms of severe aphosphorosis, the animals showed inappetence, loss of milk, loss of condition, anaemia and slight jaundice as constant symptoms. Most cases were fatal within 3-5 days but some responded to large doses of phosphate orally and parenterally. Constant lesions at autopsy included slight jaundice, "khaki" discoloration of areas of lung, omentum and other organs, markedly enlarged gall bladder, enlarged and very flabby heart with petechiation of the heart muscle, especially along the septa, slightly enlarged spleen and chocolate discoloration of the blood. The anaemia was confirmed in the laboratory. Cases ceased to occur in all herds concurrently with adequate bonemeal supplementation.

Miscellaneous Diseases.

Corynebacterium renale was confirmed as the cause of pyelonephritis, a kidney disease, in a bovine. This condition is rare in Queensland.

No cases of St. George disease were reported. No further cases of Johnes disease have been encountered. One previous case in an introduced bull was confirmed by growth of the organism some 12 months after the original culture was attempted. This property was cleared by blood testing of in-contacts and the destruction of two animals that gave suspicious reactions. It is considered that persistence of the organism would not be encouraged under arid tropical conditions.

Heavy sawfly activity was reported from the Upper Burnett; a number of cases of poisoning, but no deaths, were reported in June. No heavy concentrations of larvae have been reported from the Maranoa.

The drought paralysis complex, which was common in the 1951 drought, was again frequently encountered. It occurs in both beef and dairy cattle in late pregnancy, usually in poor but strong animals. Supplementary feeding of pregnant animals prior to the onset of symptoms

reduced the number of cases but no treatment was uniformly effective. Cortotropin in a limited number of cattle appeared ineffective. General care, nursing and supportive treatment were sometimes sufficient to carry affected cattle over parturition, after which many recovered strength. A secondary ketosis was frequently present, but glucose supplementation, though helpful in some cases, was generally not sufficient to effect recovery.

The neonatal syndrome referred to in previous reports was noted on only one property at Kingaroy and one at Wandoan. Vitamin K therapy has been tried, but in view of the paucity of cases during the year the difficulty in assessing its usefulness persists.

One suspected case of malignant bovine catarrh was detected near Roma. Lesions and symptoms were suggestive of malignant bovine catarrh but no definite pathological proof could be obtained. A motion picture of the case was obtained.

Extensive cellulitis from dingo bites, leading to toxaemia, was responsible for deaths on several properties. A pasteurella was recovered from one of these occurrences.

Owing to severe fluctuations in tick numbers, tick fever was more common than usual, particularly in areas normally heavily infested with ticks. Heavy losses occurred in beef cattle in the Upper Warrego and on the Barkly Tablelands. Anaplasmosis was reported from the Taroom and Injune areas and from Southport.

On several occasions cattle for export originating in clean country have been held at ports due to shipping hold-ups. It has been the practice to recommend dipping every five days in DDT and no cases of tick fever have occurred.

As foreshadowed in the previous annual report, heavy losses from Georgina River disease occurred in the north-west associated with the dry season and a heavy podding of *Acacia georgina*. Up to 200 head of cattle were lost in a single mob and all suspect properties reported some losses; shifting stock to safe country prevented further deaths.

Mild and scattered outbreaks of ephemeral fever occurred in North Queensland in April and May. In this area the disease appears to be mainly confined to young stock under two years. The symptoms are mild and the morbidity seldom exceeds 5 per cent. It has not caused any undue interference to the shipment of fat cattle.

A few atypical cases of what may have been ephemeral fever were reported in southern districts.

DISEASES OF SHEEP.

Pregnancy toxaemia was prevalent in the period June-October, especially on the Darling Downs. Supplementary feeding, which was widely practised, was generally commenced too late to prevent the trouble. Oral glycerine therapy gave variable results, probably because treatment was instituted too late in many cases.

Enterotoxaemia was responsible for isolated losses. Routine vaccination is practised in some flocks in the Dalby and Warwick districts.

Several heavy losses from tetanus followed marking and shearing.

DISEASES OF PIGS.

Melioidosis was reported in pigs in Townsville but the incidence shows a considerable decline. No cases have been reported since the end of 1957. The organism was isolated from the spinal canal of a bovine affected with paraplegia.

Cases of acute erysipelas were reported from most districts but in general the incidence was low.

A meningo-encephalitis in weaner pigs was reported from North Queensland, characterised by fever, ataxia and excitement. Treatment with penicillin was ineffective. A haemolytic streptococcus was isolated from cerebrum, heart, blood and liver. Similar organisms were associated with pig losses in other areas but did not set up infection of the central nervous system.

Mange, pneumonia, Glasser's disease and spirochoetosis were common. Avitaminosis A was recorded sporadically.

DISEASES OF HORSES.

Strangles appears to be important only in the northern areas, where on some properties the infection of a large percentage of the working horses has caused cessation of stock work for varying periods. Vaccination has limited the spread, where conscientiously applied.

Only two outbreaks of walkabout were reported. In one case *Crotalaria novae-hollandiae* was implicated. No *C. retusa* could be found on this property.

Cases of Birdsville disease were reported in July and August but losses were comparatively light and the disease was not widespread.

DISEASES OF POULTRY.

Infectious laryngo-tracheitis was reported from Cairns, Brisbane and Millmerran. A total of 49,600 chickens was vaccinated, mainly with mixed I.L.T.-fowlpox vaccine.

An unidentified protozoan parasite was detected in red blood cells on a Brisbane property. It was found in battery pullets associated with unthriftiness and anaemia. One group of pullets treated with paludrine gave an apparent response to treatment.

Chronic respiratory disease remained extremely prevalent but good control was obtained by streptomycin injections.

Bluecomb was again encountered and in a limited trial furazolidone in mash appeared to be more effective than oxytetracycline in drinking water.

Isolated outbreaks of cholera, primary chick nephritis, haemorrhagic disease, botulism and encephalomyelitis were reported.

EXTERNAL PARASITES.

Cattle Tick.

Except in North Queensland and in the Taroom-Wandoan area, tick activity has been comparatively light due to adverse seasonal conditions and to vigorous control measures.

In the Toowoomba area, ticks were found only on seven properties outside the declared areas and these were adjacent to the coastal watershed. Cleansing work has been commenced in the Coalbank area.

During the year quarantine restrictions were imposed on 11 properties and removed from 27. Restrictions in the Jackson area have been removed as no ticks have been found since the initial outbreak. Restrictions at Blackall and Tambo have also been lifted.

The Branch is co-operating with officers of the New South Wales Department of Agriculture in assessing the efficacy of two DDT preparations in dipping vats.

Thirteen new dipping vats have been installed on properties in the marginal areas of the Warrego and Maranoa. They are mainly charged with a DDT paste preparation. Work has been commenced on a Departmental dipping vat in the vicinity of Mount Isa to treat travelling cattle.

Buffalo Fly.

Owing to dry weather there was little southward extension of the buffalo fly during the summer and it did not reach Bundaberg. No further extension is now expected until next summer.

Further trials were carried out with back rubbers for the control of buffalo fly. Using 5 per cent. DDT in fuel oil, four back rubbers were set up in a paddock containing 200 bullocks. No additional treatments were needed between January and the end of April. Two sprayings were necessary during the same period in an adjoining paddock.

Stickfast Flea.

Further infestations of dogs, cats and poultry with *Echnidnophaga gallinacea* were reported at Irvinebank, Cairns, Baralaba, Warwick and Urangan. Treatment of exposed animals was instituted.

Scrub Tick.

Losses in calves, pigs and dogs were reported in endemic areas.

Itch Mite.

The itch mite in sheep (*Psorergates ovis*) has been found much more commonly, particularly on the south-eastern Darling Downs. The substitution of chlorinated hydrocarbon dips for arsenic in the control of lice infestation is blamed for this recrudescence. Some landholders have reverted to arsenic, but sulphur-dieldrin dip mixtures have been used and appear to have been successful.

Lice.

Cattle lice infestations were heavy during the winter and spring of 1957, but sheep lice control is improving due to the use of organic insecticides. Very few travelling mobs were found to be lice-infested and requiring treatment.

Sheep Blowfly.

General activity was low, partly due to seasonal conditions and partly to husbandry measures used and chlorinated hydrocarbon dips.

INTERNAL PARASITES.

Seasonal conditions were against a heavy build-up of internal parasites. However, losses in calves were caused by *Haemonchus placei*, usually on overstocked and swampy areas.

Lungworms and hookworms caused severe losses on some properties. Lungworm infestation was reported in cows from widely separated parts of Central Queensland on slaughter, but the parasites had apparently caused no clinical symptoms.

Little trouble has been encountered with internal parasitism in sheep except in coastal areas where sheep raising is becoming more popular, and in the north, where Haemonchus outbreaks were widespread.

Sparganosis infestation has caused numerous pig condemnations, particularly in North Queensland. Almost without exception only feral pigs or pigs on free range have been affected.

POISONING.

Arsenical poisoning was again recorded in cattle. Thirty-five head were lost through licking the woodwork of a dipping vat. Sixty-five head were lost through accidental dilution of arsenical concentrate at 1:32 instead of 1:320. Seventeen calves were killed in over-strength DDT-arsenic mixture, and 13 cows were killed by arsenic in trough water (probably malicious).

Lead poisoning was recorded in foals, calves, dogs, and adult cattle. Overdosing with phenothiazine caused the death of a large number of calves on one occasion.

Deaths following spraying or dipping in BHC, dieldrin, organic phosphates and DDT-BHC mixtures were reported. Some sickness in cattle was attributed to farmers spraying with parathion for tick control. In some cases the insecticides were up to 10 times recommended strength, but in others there does not appear to have been any known precipitating cause. BHC toxicity was similarly reported in the drought of 1951. Cattle affected have usually been poor but strong and weaker cattle have been dipped on neighbouring properties without loss.

Selenium poisoning was reported near Richmond in horses, and samples of *Neptunia amplexicaulis* from the affected paddocks showed from 77 to 4,334 p.p.m. selenium on a dry-matter basis. Samples taken in spring and early summer were the most toxic.

Moderate losses followed drenching of sheep with nicotine sulphate.

As is usual in dry years, widespread losses occurred from ingestion of poison plants. The most serious losses were in hungry travelling stock.

The following plants were implicated: Hoya vine (*Hoya australis*), *Lantana* spp., bracken (*Pteridium aquilinum*), rock fern (*Cheilanthes* spp.), kangaroo apple (*Solanum laciniatum*), poison peach (*Trema aspera* var. *viridis*), Darling pea (*Swainsona* spp.), fuschia bush (*Eremophila maculata*), grasstree (*Xanthorrhoea* spp.), mint weed (*Salvia reflexa*), Cooktown ironwood (*Erythrophloeum chlorostachys*), Brazilian nightshade (*Solanum seaforthianum*), heart-leaf poison (*Gastrolobium grandiflorum*), green cestrum (*Cestrum parqui*), and whitewood (*Atalaya hemiglauca*) pods.

A series of dry periods followed by rain favoured successive seedling crops of Noogoora burr, which caused widespread losses in cattle and pigs on free grazing.

Paspalum ergot gave rise to typical symptoms and some deaths, particularly on the Darling Downs and in other south-eastern areas.

The practice of feeding linseed gradings in the Toowoomba area caused losses from HCN poisoning, particularly in sheep but also in cattle and horses. In one case where 11 cows out of 13 fed were lost, analysis of the gradings showed 454 mg./100 g. HCN.

HCN poisoning following grazing on sorghum crops was more frequent than usual.

Fifty head were lost in a mob of cattle travelling several times past a dump on which oleander (*Nerium oleander*) cuttings had been thrown. This plant was suspected in several other deaths.

Several heavy losses of sheep were apparently associated with grazing on mintweed. Pathological examinations revealed a primary asthmatic lung condition with bronchial spasm and emphysema. Careful handling and rest led to recovery.

Phalaris staggers was reported in sheep for the first time in this State; it was associated with grazing on *Phalaris tuberosa*.

Heavy losses occurred in a mob of travelling cattle which had access to a dense growth of Ellangowan poison bush (*Myoporum deserti*). Boobialla (*Myoporum acuminatum*) was also incriminated in losses.

EXTENSION.

In addition to the usual complement of field days and film evenings, a number of producer schools were organised. These schools lasted for four or five days and were based on farmer participation. Four schools for dairy-farmers were held on the Atherton Tablelands, and a graziers' school was conducted at Magnetic Island.

Arising from comments at the graziers' school, a demonstration of grading beef carcases on the hoof and on the hook was organised at the Ross River meatworks, Townsville, with the co-operation of the Commonwealth Department of Primary Industry. The main object was to familiarise growers with the requirements for chiller grade beef.

Officers also assisted at producer schools at the Bureau of Tropical Agriculture, South Johnstone.

Considerable interest in these schools was shown by producers and it is likely that they will be repeated at appropriate times and places.

A specialist veterinary officer has now been appointed to co-ordinate the growing mass of extension activity of the Branch and to channel appropriate information and research results to field staff. It is hoped in this way to keep field officers, who are necessarily somewhat isolated from modern research thinking, in a position to pass on new concepts to the producer with a minimum of delay.

To assist officers to render maximum assistance to producers, a 5-days school on disease control and administration was held at Toowoomba for stock inspectors.

QUARANTINE ACTIVITIES.

Owing to the ban on importation of cattle from the United States of America, supervision of imported cattle has been reduced, but derris treatment was maintained on a number of imported English cattle.

The influx of European migrants and Asiatic students has greatly increased the number of prohibited articles intercepted in parcels, etc. The introduction of certificates to cover the preparation of tinned meats has also increased the work of quarantine officers.

The main increase in activity has, however, been in relation to exports of breeding cattle to New Guinea and the Philippines. Whereas cattle are imported to Australia as individual animals, they are now being exported in lots of up to 900 in each consignment. One ship, the M.V. "Natone", is on long charter to carry breeders and slaughter cattle to New Guinea and has already carried six loads of approximately 90 head per trip.

The conditions of certification of these cattle, especially those consigned to the Philippines, are extremely exacting, requiring the checking of ear tags of large numbers of cattle against tests. These cattle frequently converge on a shipping point in the space of a few hours, requiring an efficient organisation to deal with them. The involved conditions of certification require ceaseless supervision beginning with the actual approval of the properties before the cattle are selected and continuing until they are finally loaded. In these matters State officers act on behalf of the Commonwealth Government. This work, although of considerable value to individual stock owners, has represented a considerable drain on the time of highly trained officers.

At present the following vessels are engaged in the export cattle trade:

New Guinea—
M.V. "Wewak" .. .. capacity 200
M.V. "Natone" .. .. capacity 100
Philippines—
Slaughter Cattle—
"San Miguel" .. .. .. capacity 1,000
"Catusha" .. .. .. capacity 1,500
"Philippine Trader" .. .. capacity 600
Breeding Cattle—
"San Ernesto" .. .. .. capacity 800

In addition, loads of 100-200 are carried on such regular vessels as the "Arafura," "Nellore," "Eastern Glory," "Eastern Star," "Eastern Saga," and "Eastern" in specially constructed deck pens.

Exports of livestock were as follows:—

New Guinea—978 cattle, 17 horses, 18 pigs.
Dutch New Guinea—9 cattle.
Philippines—
Breeding—1,787 cattle, 80 horses.
Slaughter—15,203 cattle.
Hong Kong—47 horses.

SLAUGHTERING.

In November, 1957, the meat grading regulations were suspended for a trial period of three months, and the suspension period was later extended.

During the year there was an increase in pre-wrapping fresh meat for the local trade in some areas, where it is proving most popular. Pre-wrapped fresh meat must be sold from a shop registered for the purpose.

Both the Townsville and Ipswich Local Abattoirs are still under construction and to date no slaughtering has taken place in them. It is expected that both will be in operation before the end of 1958.

Meatworks building activity in Queensland continued during the year. The Roma meatworks was completed to a stage where slaughtering could begin, but operations ceased soon after their commencement.

During the year the Callide-Dawson Valley Co-operative Bacon Association began the construction of its meatworks at Biloela. This works is not yet completed or in operation.

A small-animals floor has been added to Dinmore Meatworks. When cattle were in short supply in the early part of the year, this works treated large numbers of sheep.

A second meatworks for the treatment of cattle is being built at Dinmore.

Details of slaughterings during the year appear in Table 4.

NEW LEGISLATION.

Amending Acts to both the Slaughtering Act and the Stock Acts received Royal Assent during the year.

Amendments to the Stock Acts included provisions to control the artificial insemination of stock and the collection and distribution of semen; to remove the necessity to replace animals before T.B. compensation could be claimed; to enable the formation of voluntary T.B. testing schemes; and to facilitate destruction of T.B. reactors.

The Slaughtering Act was amended to delete the supervision of retail smallgoods sales and to include certain necessary machinery clauses.

BREACHES OF ACTS.

Although breaches of the various Acts administered by the Branch occurred from time to time, in general the compliance of stock-owners was extremely good owing to the good relations existing between them and the Department. There were 16 prosecutions under the Stock Acts.

Infringements of the Slaughtering Act where public health may be involved are regarded very seriously. Sixteen prosecutions were successfully initiated. Offences were mainly in regard to unsatisfactory hygiene and slaughter on unregistered premises. In view of the volume of slaughtering in the State it is evident from the small number of prosecutions that most butchers are aware of their responsibilities.

BRANDS.

Details of Registrations, Transfers, etc. for the year 1957-58.

Item.	Number.	Number Since Inception of Legislation.
Ordinary three piece Horse and Cattle Brands Registered ..	..	92,242
Cancelled Horse and Cattle Brands Re-allotted	644	19,242
Horse and Cattle Symbol Brands Registered	71	3,314
Horse and Cattle Brands Transferred	1,333	89,015
Cattle Earmarks Registered ..	492	38,918
Sheep Brands and Earmarks Registered	327	15,733
Sheep Brands and Earmarks Transferred	318	10,645
Distinctive Brands Registered ..	..	1,356
Alterations of Address	184	..
Brands Cancelled	38	..
Earmarks Cancelled	131	..

There has been an increase in the number of registrations of sheep brands and earmarks and transfers of horse and cattle brands and sheep brands and earmarks and a decrease in the registrations of cancelled horse and cattle brands, symbol brands and cattle earmarks.

Stock-owners generally appear to be observing the requirements of the Acts, as few cases of irregular branding and earmarking have been reported. One owner was proceeded against successfully for irregular earmarking.

The Horse and Cattle Brands Directory complete to the end of 1952, which was received in February 1957, is being brought up to date and should be ready for printing in the near future.

The Sheep Brands and Earmarks Directory complete to the end of 1954 was received in October last and a revised copy is being prepared for printing.

TABLE 4.

STOCK SLAUGHTERED FOR LOCAL CONSUMPTION, 1957–58.

—	Bullocks.	Cows.	Calves.	Sheep.	Swine.
City of Brisbane (Abattoir)	76,725	59,258	83,571	587,944	37,475
City of Toowoomba (Abattoir)	9,492	3,858	4,030	45,522	4,831
*City of Bundaberg (Abattoir)	3,042	2,343	3,999	9,094	1,493
Bacon Factories	11,848	79,344	70,804	12,922	245,372
Larger Population Centres	104,734	110,569	121,217	264,610	67,958
Country Centres	40,806	31,843	23,972	104,554	16,932
Totals	246,647	287,215	307,593	1,024,646	374,061

*November to June only.

PATHOLOGY BRANCH.

Mr. L. G. Newton, Director of Pathology.

The Pathology Branch, embracing the pathology wing at the Animal Research Institute, Yeerongpilly, and the animal Health Station, Oonoonba, was formed in July 1957 when the Research Branch was separated into husbandry and pathology interests.

The functions of the Branch are fourfold—the performance of laboratory techniques to aid in the diagnosis of disease; research into problems referred to the Branch by the various technical committees and in relation to specimens submitted for pathological examination; the immunisation of cattle against tick fevers; and the preparation and distribution of vaccines.

To facilitate the working of the Branch several sections, including diagnostic pathology, histopathology, protozoology, bacteriology, serology and parasitology, have been set up. Each may act autonomously or contribute on a team basis to the solution of problems.

DIAGNOSTIC WORK.

The most important function of the Branch is the examination of specimens submitted for diagnostic purposes. A total of 4,754 batches of specimens was examined by the two laboratories during the year. Included in this total were 1,347 fowls, 134 pigs, 68 cattle, 58 sheep, 2 horses and 73 birds and animals of other species submitted for autopsy.

Serological tests are used more extensively each year as an aid to diagnosis and a feature of the year's work was the large number of tests for bovine contagious pleuropneumonia and brucellosis on cattle being exported to the Philippines. Table 1 sets out the number of serological tests performed.

TABLE 1.

DETAILS OF SEROLOGICAL TESTS.

Disease.	Yeerong pilly.	Oonoonba.	Total.
Bovine contagious pleuropneumonia complement fixation tests	6,609	3,660	10,269
Brucellosis agglutination tests—			
Cattle	7,912	3,347	11,259
Pigs	2,089	50	2,139
Leptospirosis agglutination tests—			
Cattle	3,818	2,079	5,897
Pigs	1,896	96	1,992
Horses	46	..	46
Vibriosis mucus agglutination tests	2,128	356	2,484
Melioidosis agglutination tests—			
Cattle	..	27	27
Pigs	..	14	14
Melioidosis complement fixation tests—			
Cattle	..	20	20
Pigs	..	26	26
Sheep	..	2,433	2,433
Erysipelas agglutination tests	40	..	40

Poisoning.

Attention is again drawn to the extent and diversity of losses due to poisoning. Some of the more important and interesting of these include:

Noogoora Burr (*Xanthium pungens*).—Extensive losses were caused by Noogoora burr seedlings in the south-eastern portion of the State following general rain in November. Numerous reports were received of sudden deaths in pigs which had access to the seedlings. Survivors often vomited and had diarrhoea and high temperatures. Autopsy examination revealed purple discoloration of the skin, internal haemorrhages and sometimes excessive fluid in the body cavities. Portions of seedlings were present in the stomach contents. Symptoms in affected cattle included violent trembling, inco-ordination and paddling of the limbs after going down.

Ellangowan Poison Bush (*Myoporum deserti*).—This plant is one of the most consistent of those causing fatalities and many deaths were attributed to it again during the year. Approximately 200 of 500 travelling bullocks died in the Charleville area in May. Large quantities of *M. deserti* were found in the ingesta and the syndrome was in keeping with poisoning due to this plant. On another occasion more than 100 cattle died and 500 others were affected in the Clermont area under circumstances which strongly suggested that this plant was responsible.

Spiny Emex (*Emex australis*).—Piglets which ate a lush young growth of this plant died within 12 hours after showing staggery gait and constant trembling. They vomited considerable quantities of the plant. The high oxalate content (6.1 per cent.) in the plant was responsible for these deaths.

Oleander (*Nerium oleander*).—Oleander clippings caused the death of 50 cattle at Miles.

Hoya Vine (*Hoya australis*).—Six cattle were affected at Boonah, four of them dying after showing symptoms of poisoning due to this plant, including paralysis of the hindquarters and the passage of hard, dark faeces with clots of blood.

Phalaris (*Phalaris tuberosa*).—Phalaris staggers was diagnosed in Queensland for the first time during the year. In the first outbreak three deaths occurred within 48 hours of sheep being grazed in a pasture in which *P. tuberosa* predominated. More typical cases occurred after six weeks' grazing. Several other outbreaks were reported.

Nitrite Poisoning.—Two outbreaks in cattle in unexpected circumstances are mentioned. Three cows in a herd at Boonah died after grazing on a crop of Cristaudo cowpea and on a second occasion other cows in the herd showed respiratory distress after half-an-hour's grazing. Chemical analysis of samples of the crop supported a diagnosis of nitrite poisoning.

Deaths from the same cause also occurred in cattle grazed on kikuyu pasture in the Maleny district. Toxic levels of nitrate were present in samples of the grass sent for analysis.

Nitrite poisoning also occurred in pigs at Gatton and in this case the water used in the preparation of the pigs' food was found to contain 2,268 p.p.m. nitrate.

Arsenic and Lead.—Poisoning due to arsenic was confirmed by the toxicologist on 31 occasions in cattle, and once each in sheep, horses and fowls. Lead poisoning was confirmed in nine outbreaks in cattle and once in horses.

Insecticides.—A heavy post-dipping mortality of about 60 of 300 cattle occurred at Clermont in cattle dipped in a BHC/DDT mixture. The symptoms were typical of those associated with the chlorinated hydrocarbon compounds, viz., severe trembling, inco-ordination and paddling movements when down followed by deaths. No explanation could be offered and indeed other cattle it is understood were later dipped in the same vat without ill effect.

Bacterial Diseases.

Of particular interest amongst the bacteriological findings were the following:—

Pasteurellosis.—Two outbreaks of an unusual type of disease in cattle caused by *Pasteurella septica* were encountered. Field officers reported the deaths of a number of Hereford weaners at Broweena, with swellings suggestive of an anaerobic infection sometimes extending from the buttocks to the fetlocks.

At Biloela approximately 10 per cent. of a lot of Hereford weaners died from a similar infection which was described as resembling blackleg.

Enterotoxaemia.—This disease is not common in Queensland and is especially rare in goats, but a classical outbreak occurred in stud goats at Maroochydore. Watery diarrhoea and weakness of the hindquarters followed by rapid death were features of the disease. *Clostridium welchii* type D toxin was present in the intestines.

Bovine Mastitis.—Specimens from several cases of bovine mastitis were received from which *Klebsiella* type organisms were isolated. As these are known to cause bovine mastitis and must be differentiated from similar but harmless bacteria, increasing attention has been given to classification of the bacteria included in the family *Enterobacteriaceae*. Identification of such cultures may take a considerable time and unfortunately from the aspect of diagnosis of a particular case of mastitis it is unlikely that this time will be shortened.

Botulism.—This disease, due to *Clostridium botulinum* type C toxin, was confirmed in ducks and magpies frequenting drying lagoons in the Kingaroy district. This is the first mortality of this kind reported in Queensland, though the disease is recognised in poultry in North Queensland.

Clostridium botulinum type D toxin was detected in the intestinal contents of a bovine from the Monto district during the year.

Ephemeral Fever.—Transmission tests carried out at Oonoonba supported the field evidence of the occurrence of ephemeral fever in North Queensland during the late summer months.

Abscesses in Pigs.—Bacteriological studies of abscesses in pigs slaughtered at the Townsville Abattoir during the year resulted in the recovery of the following organisms on the number of occasions indicated:—

Brucella suis	2
Malleomyces pseudomallei	9
Pasteurella septica	20
Corynebacterium ovis	3
Corynebacterium pyogenes	5
Corynebacterium equi	1
Haemolytic streptococci	6

Guinea pig inoculation for the recovery of *Pasteurella septica* was better than other methods.

Shigella equuli infection caused the death of a foal at Dalby.

Tick Fevers.

Tick Fever.—Fifty-nine outbreaks of tick fever due to *Babesia argentina* and five due to *Babesia bigemina* were confirmed by examination of smears submitted during the year. Forty-four of the outbreaks occurred during the second half of the year, with an unusually high incidence extending into June. Anaplasmosis was confirmed on two occasions.

RESEARCH.

Resumes of investigations completed or in progress are set out below.

Tick Fever.

Persistence of B. argentina Infection.—This experiment was designed to determine for how long a steer infected with *B. argentina* can transmit the organism when blood is inoculated into susceptible animals.

At monthly intervals, blood from a "carrier" prepared in April 1957 was inoculated in 100 ml. amounts into paired steers, a fresh pair being used each month. Transmissions were successful up to the third month, but in the fourth month one of the two steers failed to show a reaction. In the fifth month neither of the two steers reacted but a splenectomized steer inoculated at the same time became infected. The two steers were susceptible to subsequent challenge with infected blood.

In a second series two additional animals in each monthly transmission have been injected with 5 ml. doses of blood. Whilst the recipients of 100 ml. doses have reacted to the first monthly transmission, those receiving 5 ml. have failed to do so.

Effect of Regular "Boosting" Doses of Infected Blood on Immunity to B. argentina.—An animal infected in May 1957 and receiving "boosting" doses of *B. argentina* infected blood each month thereafter has regularly transmitted infection to paired steers injected with 100 ml. blood at 4-weekly intervals over a period of 14 months.

Trials with New Chemotherapeutics.—Compound 10.073 has been used for treatment of nine animals, six of which were experimentally infected with *B. argentina*, two with *B. bigemina* and one with both parasites. This drug is given subcutaneously. It gave good results against both species of organisms and no toxicity was observed. It has the drawback of being somewhat inconvenient to use.

The compound "Ganaseg" (Berenil) which has been used successfully against babesiosis in Africa has been used for the treatment of nine cases, two infected with *B. bigemina* and seven with *B. argentina*. The drug is given intravenously. The response has been slower than is desirable and relatively severe relapses have occurred.

Tick Control.

The efficiency of the organic phosphorus acaricide "Asuntol" (3-chloro-4-methyl-7-oxycoumarine dimethyl thiophosphoric acid or Bayer (21/199) was investigated under field conditions against cattle ticks on a property near Beaudesert. The acaricide was in the form of a wettable powder and used at a concentration of 0.05 per cent. active principle through a cattle spray race. Four sprayings were possible during the short tick season; in each case the kill of ticks was very satisfactory. Engorging nymphs appear to be resistant and some of these are able to moult and complete their development. However, the majority of surviving nymphs were killed before they reattached as young adults.

"Asuntol" has a definite residual effect against re-infesting larvae. The actual period of protection varied with the spraying. The general level of tick infestation was always very light so that the exact significance of the small number of ticks that survived spraying could not be determined. However, the preparation shows promise of being a very useful acaricide for the control of cattle ticks.

Sheep Body Strike Experiment.

Experiments to evaluate new insecticides in the control of body strike have been continued. The limited data available show that "Asuntol" (Bayer 21/199) at a concentration of 0.75 per cent. is persistent in the fleece of long-woolled sheep for at least 16 weeks. However, 0.05 per cent. "Asuntol" on sheep two months off shears did not persist beyond four weeks.

Two other organic phosphorus insecticides, Nexion 1384 and D.D.V.P., at a concentration of 0.1 per cent. had completely disappeared from the fleece when checked four weeks after treatment.

Psorergates ovis Infestation.

There appears to be a definite seasonal incidence in the number of itch mites present on the skin of sheep. Both field and laboratory observations have shown that mites are plentiful during the spring and early summer but populations decline rapidly during midsummer and are difficult to demonstrate by the autumn. With the advent of cool weather immature stages are again noted and there is apparently a rapid build-up during the winter and early spring.

The severity of clinical symptoms cannot always be correlated with the number of mites present. Frequently a heavy mite population may be present with little if any apparent symptoms; in other cases, particularly in late summer, gross clinical symptoms are noted and the mites are then difficult to demonstrate. The seasonal variation in mite numbers makes interpretation of negative skin scrapings difficult.

Coccidiosis of Poultry.

The coccidiostat nicarbazine when fed continuously at a rate of 0.0125 per cent. in the ration is very effective in preventing deaths from experimentally induced caecal coccidiosis. Exposure of chickens to an intake of oocysts that would produce over 90 per cent. mortality in untreated chickens did not produce any deaths in the treated groups.

There appears to be a delay in the development of immunity when nicarbazine is fed continuously in the ration and this could be a serious factor in the management of chickens raised for egg production.

Melioidosis.

A complement fixation test similar to that used for the diagnosis of bovine contagious pleuropneumonia has been developed at Oonoonba. This test has given satisfactory results when applied to experimentally infected animals and two small groups of animals in the field. Titres have been shown by the test to develop in experimentally infected sheep by the 7th day post-injection, and in animals which have died titres reached a maximum of from 1/160 to 1/1,280. In sheep which survived, the titres persisted for seven months. The serum of several of 119 rams tested at a Departmental field station showed weak reactions at a dilution of 1/10, while two others showed slightly stronger reactions. In another flock of 140, several serums showed slight reactions only. The significance of these low titres is being investigated.

TICK FEVER IMMUNISATION.

A total of 362 stud cattle was immunised against tick fever, 68 of them at Oonoonba. It is pleasing to note the increasing numbers passing through Oonoonba following an arrangement with the owners that, as far as possible, cattle for destinations north and west of Townsville be sent to that centre.

Preliminary investigations suggest that by a slight modification in the procedure used it may be possible to reduce the time required for immunisation from the usual 4-6 weeks to 2 weeks.

Although for some years *Anaplasma centrale* was omitted from tick fever vaccine, this organism is once again available for protection of cattle against *Anaplasma marginale*. It is hoped, however, that its use will be restricted to areas where anaplasmosis is known to occur.

VACCINES.

The number of doses of vaccines supplied during the year is shown in Table 2.

TABLE 2.

DETAILS OF VACCINES SUPPLIED.

——	Yeerongpilly.	Oonoonba.	Total.
Bovine contagious pleuropneumonia (doses)	240,550	310,050	550,600
Infectious laryngo-tracheitis (doses)	62,400	..	62,400
Brucella abortus (Strain 19) (number of calves inoculated)	14,108	..	14,108
Tick fever blood (doses)	43,131	10,388	53,519

Distributions of bovine contagious pleuropneumonia vaccine were below last year's total. The effect of the drought during the second half of 1957 is reflected in reduced sales of vaccines during that period.

It will be noted that there was a particularly heavy demand for tick fever vaccine during the year, particularly during the last few months, when outbreaks of the disease followed the late wet season. Not only were sales of blood vaccine much higher but the 175 bleeders sold was a much higher figure than the previous year's.

Infectious laryngotracheitis vaccine has been supplied as a freeze-dried preparation from the beginning of the year. The demand for this vaccine has also increased.

ANIMAL HUSBANDRY RESEARCH BRANCH.

Mr. J. W. Ryley, Chief Husbandry Officer.

In recent years it has been appreciated that greater benefits can be obtained by preventing disease than by controlling it. In consequence, husbandry problems are assuming greater significance.

In 1954, a Husbandry Section was formed within the Research Branch, to concentrate on problems associated with the feeding, breeding and management of livestock. In 1957, the Animal Husbandry Research Branch was formed as a separate entity, with headquarters at the Animal Research Institute, Yeerongpilly, and the main experimental facilities at the Animal Husbandry Research Farm at Rocklea.

The permanent staff of four graduates and four technical assistants is engaged in the main on experimental work with cattle and to a lesser extent with sheep.

For research work adequate facilities are essential and considerable progress has been made in this regard. The 350-acre farm has been subdivided into a number of small paddocks. Farm roads and drainage channels have been constructed. A building has been equipped to individually house 40 cattle and eight small yards have been built for group feeding experiments. Other facilities are cattle-working yards, a weighbridge, a photogrid and a steel dip. Fifty acres of cultivation are maintained to produce crops for use in nutrition experiments and to provide conserved fodder. At present approximately 450 tons of sorghum silage are conserved in trench silos. Approximately 500 tons of silage were used during the year for experimental work and for feeding of cattle at Yeerongpilly when the cost of fodder was high.

Projects concerning nutrition of livestock include studies on drought feeding of cattle and sheep; mineral deficiencies of cattle and sheep; and the influence of management on cattle grazing paspalum pastures. In much of this work the Branch is associated with the Biochemical Branch. Officers of the Division of Plant Industry are co-operating in the management experiments.

The major project in animal breeding is concerned with the collection, processing and distribution of semen for use in bull proving.

NUTRITION.

Drought Feeding Experiments.

Experiments on drought feeding have been concerned mainly with the requirements for survival of maiden heifers. In this work native grass hay (bush hay) and sorghum silage, both of which can be conserved in large quantities on some beef properties, have been studied. Preliminary investigations have also been made into the use of grain sorghum for the drought feeding of cattle. In order to stimulate drought conditions the experimental animals have been confined to small bare yards. The findings of the experiments completed this year are detailed below.

Bush Hay.—In the reports of the Research Branch for the years 1955-56 and 1956-57, the results of experiments to determine the suitability of bush hay as a drought fodder were presented. In these experiments bush hay with a crude protein content of 4.6 per cent. permitted survival of maiden heifers 18-24 months of age, with little weight loss, for periods of six months. When the bush hay was supplemented with small amounts of either lucerne chaff, meatmeal, crushed sorghum or urea, the heifers either maintained or gained weight.

In 1957-58 this work was continued to evaluate bush hay of lower protein content and to determine the effect of exercise on heifers during drought feeding. Bush hay with a crude protein content of 3.1 per cent. was obtained from the Central Highlands. It was fed to four groups of eight Hereford heifers, 13 months of age. Deaths began to occur during the 12th week of the experiment in the group which was fed bush hay as the sole ration. Supplements of either 2 oz. urea or 2 oz. urea plus 1 lb. crushed grain sorghum per head per day increased bush hay consumption, but animals became weak and deaths commenced during the 16th week. Exercise did not appear to increase either mortality rate or loss in body weight. The experiment terminated after 17 weeks, because all surviving animals were in a weak condition.

At least three factors contributed to this poor survival—the lower quality of the bush hay; the use of younger animals; and the poor condition of the heifers at the beginning of the experiment. These heifers were obtained from an area where drought conditions had existed for some time. It has not been possible to assess the effect of these individual factors. However, the results indicate that it is necessary to commence drought feeding while animals are still strong, and that bush hay of this low quality requires a high rate of supplementation to permit survival of young cattle.

Sorghum Silage.—Sorghum silage has been examined for its suitability as a drought reserve fodder. This silage had a crude protein content of 5.2 per cent. (dry matter basis) and was comparable with that which has been conserved in western Queensland.

Four groups of seven Hereford heifers were fed a basal ration of silage, with various levels of urea supplementation. All heifers survived the experimental period of 28 weeks. The experimental rations, changes in body weight and silage consumption are shown in Table 1.

TABLE 1.

DATA FROM SILAGE FEEDING EXPERIMENTS.

Group.	Sorghum Silage.	Supplement—head/day.	Average Bodyweight (lb.).			Average Silage Consumption as lb. D.M./ head/day.
			Initial.	After 28 weeks.	Change.	
I. ..	*Ad lib.*	Nil	383	313	−70	5·0
II. ..	Same level as eaten by Group I.	1·5 oz. urea	389	357	−32	5·0
III. ..	*Ad lib.*	1·5 oz. urea	379	449	+70	8·2
IV. ..	*Ad lib.*	2·5 oz. urea ..	390	507	+117	9·1

* Because experimental work has shown that sulphate is necessary for maximal utilization of urea, 0.14 oz. sodium sulphate was added to the 1.5 oz. urea fed to Groups II. and III. and 0.18 oz. added to the 2.5 oz. fed to Group IV.

The results show that silage of this quality, when fed *ad lib.* as the sole ration, will keep heifers alive for 28 weeks with an average weight loss of 10 lb. per month. Supplementation with urea markedly increased consumption and elevated the silage from a survival to a production ration. The heifers in Groups III and IV were stronger and much more active than those of the other two groups. The better condition of animals in Group IV when compared with those in Group I is illustrated by Plates 1 and 2. All animals made good weight gains when turned out on pasture.

Plate 1.—Group of Heifers (Group I) After Seven Months' Feeding on Sorghum Silage ad. lib.

Plate 2.—Group of Heifers (Group IV) After Seven Months' Feeding on Sorghum Silage ad. lib. **plus 2.5 oz. Urea and 0.18 oz. Sodium sulphate per Head per Day.**

A similar experiment was conducted with four groups of 13 2-tooth Merino wethers of an average initial body weight of 66 lb. The two levels of urea supplementation were 8 g. and 16 g. per head per day.

Two sheep did not survive the experimental period of 22 weeks. The survivors quickly regained their initial body weight when turned out on pasture. All groups which were fed urea with the silage had a similar average body weight loss of approximately 14 lb. The unsupplemented group lost an average of 19 lb. in body weight. The 8 g. level of urea resulted in a 20 per cent. increase in silage consumption, whereas there was only a 10 per cent. increase with the 16 g. level. This suggests that the higher level of urea reduced palatability. Sheep did not respond as well as cattle to urea supplementation, but other more palatable protein-rich supplements may prove more effective.

It has been estimated that, under dry-farming methods, many millions of acres of Queensland are agronomically suited for sorghum culture. This high potential production, when considered in relation to the findings of these experiments, emphasises the importance of sorghum silage as a drought reserve fodder in this State.

Grain Sorghum.—A preliminary experiment was designed to assess the value of crushed grain sorghum as a drought fodder for cattle. Eight heifers, between 15 and 18 monthe of age and with an average initial body weight of 561 lb., were fed in individual stalls with 3 lb. crushed sorghum per head per day; 1 per cent. ground limestone was mixed with the grain. No other feed was available to the animals. Duration of feeding was 27 weeks.

All animals remained strong. The average loss in body weight during the first nine weeks of the experiment was 10 lb. per head per week, but the rate of weight decline over the final 18 weeks was only 3.3 lb. per head per week. When turned out on pasture at the end of the experiment, the animals regained their average initial body weight within four weeks. The effect of "rumen fill" influenced the initial experimental body weight loss and the post-experiment weight gain.

A further experiment is planned to compare daily, twice-weekly and weekly feeding.

Mineral Deficiency.

Copper.—This work was commenced because grazing cattle at Rocklea, in common with those in many other areas of coastal Queensland, have low liver copper reserves. This low copper status in cattle occurs at Rocklea despite a satisfactory copper status of the pasture.

A study of the comparison of copper metabolism in sheep and cattle grazing the same paspalum pasture at Rocklea has been in progress for over two years. Results to date indicate that, on this pasture, sheep and cattle show similar seasonal fluctuations in liver copper reserves, with maximum levels in late summer and minimum levels in late winter and early spring. Sheep usually maintain adequate liver copper reserves, whereas in cattle the status is low. Pregnancy does not markedly affect liver copper reserves in either sheep or cattle. Despite the low liver reserves in the cows, calves are born with high concentrations of copper in their livers (mean 375 p.p.m.) but these decline rapidly. At five months of age the calves have levels comparable with their dams. Lambs are born with and maintain liver concentrations similar to those of their dams.

During the past four years, a number of copper compounds have been tested for suitability for subcutaneous injection as a means of correcting copper deficiency in ruminants. The object is to obtain a compound which causes minimal local damage at the site of injection, has a low toxicity and results in a high storage in the liver. In the past year, a copper cerate compound which has been used successfully in New Zealand was tested. It proved satisfactory for cattle, but caused damage at the site of injection, characterised by exudation and sloughing, in approximately 30 per cent. of the Merino sheep used for the test.

Phosphate.—Nauru rock phospate is a cheap phosphate supplement, but it contains a high level of fluorine. An experiment to determine the effect of this high fluorine content on young cattle has been completed. Six comparable dairy-type heifers four months of age were allotted to two groups. One group was fed Nauru rock phosphate at the rate of 1 oz. per 250 lb. body weight per day, while the other group received an equivalent amount of phosphate as tricalcium phosphate. The heifers were mated at approximately 12 months of age.

There was a decrease in growth rate and a marked reduction in milk and butterfat production in animals fed rock phosphate. Clinical evidence of fluorosis was characterised by discoloration and pitting of incisor teeth and exostoses on the skeletal bones. Analyses were done at 6-monthly intervals on vertebrae surgically removed from the tail and showed high levels of fluorine. These findings indicate that Nauru rock phosphate is unsuitable as a phosphate supplement for young stock.

Rotational Grazing Experiment.

This experiment is designed to study the effect of rotational grazing, with fodder conservation, on the growth rate and grazing behaviour of cattle. The botanical and chemical composition of the pasture is also being studied. The experiment has been in progress for 20 months. Two equal areas of predominantly paspalum pasture are being grazed by two comparable groups of Hereford heifers, at a stocking rate of one beast to the acre. One area is continuously stocked; the other is subdivided into four paddocks, each paddock being stocked for one week in a 4-weeks rotation. Half of the animals in each group are being maintained copper-adequate by regular intravenous injections of copper sulphate. Untreated animals show biochemical evidence of copper deficiency.

This experiment has to be continued for a number of years, to include a range of seasonal conditions, before a valid comparison can be made. In the year under review, seasonal conditions were not favourable for good pasture growth and weight gains were unsatisfactory in both groups. The rotational group lost less weight than the continuously stocked group during late winter and spring, when silage conserved from the rotational paddocks during the previous summer was fed back. This slight weight advantage has been maintained. The copper-treated animals in both groups have shown slightly better growth rates than the untreated controls.

BREEDING.

Bull Proving Project.

This project was commenced in 1955 with the object of identifying Jersey bulls capable of siring high-producing daughters. Four young Jersey bulls are tested each year. Semen is collected, diluted and chilled at Rocklea and despatched by rail three times weekly to the insemination area in the Nambour-Maleny district. Cows in the herds of 50 co-operating farmers were inseminated by officers of the Cattle Husbandry Branch.

The year's insemination period commenced on Oct. 1, 1957 and continued for 138 days. The period was longer than in previous years, due in part to unfavourable seasonal conditions and in part to the necessity to inseminate heifer progeny from the 1955-56 bulls. One-hundred-and-five heifers were inseminated. This number is lower than was anticipated, but was caused by poor sexual development in a high proportion of the heifers. Mating of the maximum number in the shortest possible period is necessary for accurate assessment of their sire's merit on the basis of daughter productivity.

Sixty-five batches of semen were despatched and 2,282 inseminations performed, with a 60-day non-return rate of 52.5 per cent. The lower conception rate was disappointing but was partially influenced by the diluent trial discussed below and a low conception rate in one of the bulls used.

It is intended to extend the bull proving project to the A.I.S. breed during 1958. Five young A.I.S. bulls have been purchased for this purpose.

Diluent Trial.

In the bull proving project for the years 1955 and 1956, the semen diluent used was equal parts of egg yolk and 3 per cent. buffered sodium citrate. Published overseas work has indicated that a diluent of 9 per cent. skim-milk powder in distilled water gave comparable or better results. A small trial, using a split-sample technique, was conducted to compare the two diluents on the basis of fertility results. Penicillin and streptomycin were used in both diluents at the rate of 500 units of each per c.c. of the diluted semen. Results were assessed on the basis of a 60-day non-return rate. Although the trial was based on a relatively small number of first inseminations, with approximately 600 cows in each group, indications were that under Queensland conditions a better conception rate was obtained with the egg yolk-citrate diluent. The difference was most marked with semen used on the third day after collection.

SHEEP AND WOOL BRANCH.

Mr. A. T. BELL, Director of Sheep Husbandry.

The year was one of low and scattered rainfall in most sheep areas. Prior to the commencement of the year under review, pastures in all sheep areas were of mixed quality. Generally, they were rank and of little nutritive value except for isolated areas in the north-west and in the Emerald district. The Cunnamulla, Thargomindah and Quilpie areas were in the early stages of drought. The Cunnamulla district had registered 4.7 in. of rain in the preceding six months.

During July 1957 falls of rain ranging from 1 to 2 in. fell at centres on the Darling Downs and in the Charleville and central portions of the State. However, these falls were patchy and the response was disappointing. Pastures growing in the harder soil types showed some improvement. Elsewhere results were negative. These conditions continued during August and September, the best falls being 1.55 in. and 1.41 in. at Warwick and Goondiwindi respectively during August.

In October, falls of 1–2 in. were recorded at all centres with the exception of Roma, St. George, Charleville and Cunnamulla. Once again the falls were patchy, following the general rainfall for the whole year. Although good falls were sometimes registered at recording centres, properties a few miles away recorded little or no rain.

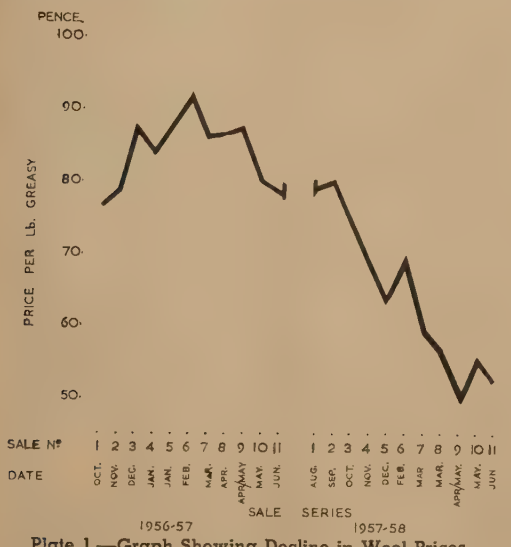
At the close of the year, pastures were still very patchy with the exception of those in the north-west and Emerald districts, which can be described as being in good order. Drought and near-drought conditions existed in parts of the south-west, where scrub feeding has been undertaken on some properties during the previous few months.

Falls of more than 2 in. of rain which were recorded on the Darling Downs and in the Maranoa in June greatly improved the feed outlook in those areas. Rain in the central districts in June may not be helpful, as it was closely followed by cold weather.

As a result of these varied seasonal conditions, it is expected that lambs reared this year in Queensland will be smaller in numbers. The decrease in the number of lambs will probably be marked because dry or drought conditions coincided with lambing in the areas where the largest numbers of lambs are usually marked.

THE WOOL MARKET.

A considerable fall in wool prices occurred during the year, when the total sale of 705,657 bales at auction realised £57.4 million. This financial return is 68 per cent. of the return for the previous year, although the quantity sold declined by only 12 per cent. This decline would have been greater but for the fact of some flocks being shorn prematurely because of drought conditions.


PENCE
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SALE SERIES
1956-57
1957-58

Plate 1.—Graph Showing Decline in Wool Prices.

The average price of wool, which had reached 91.99d. per lb. in February 1957, declined almost continuously to a level of 63.06d. per lb. in December 1957. This downward trend was temporarily halted at the sale held in Brisbane at the beginning of February 1958, when, owing to strong Japanese buying, prices rose 5–7½ per cent., bringing the average price to 68.49d. However, this rise was short-lived, and prices fell again gradually until May 1958, when the market improved slightly to an average price of 55.7d. The final wool sale of the season was held in June, when prices showed a decline of 2½ per cent. on May prices for the first day of the sale. This decline was arrested for the better wool types in the final days of the sale but faulty types showed little improvement. The average price received was 52.84d. Plate 1 shows the variation in the price of wool since October 1956.

EXTENSION WORK.

The high number of occasions on which officers gave advice and demonstrations to sheep owners on feeding (1,100 occasions) and the control of parasites (1,450 occasions) is an indication of climatic conditions that existed in the sheep areas during the year.

Internal parasites have, as a result of a run of good seasons, extended into areas where previously they had not been found. In consequence, graziers in these latter areas, through inexperience, often did not recognise their presence until post-mortem examinations were made by officers of the Department.

In addition to these two aspects of sheep husbandry, advice and demonstrations for the selection and mating of breeding flocks have been asked for on 1,600 occasions.

This, in conjunction with results from the fleece testing laboratory, would tend to show that graziers are interested in making use of all available methods to improve the quality of their flocks.

Officers during the year participated in 24 field days. These serve as a medium to bring new findings to the notice of sheep owners, who are then able to implement these findings on their properties.

A school was held in the south-west during September 1957 for officers of a large pastoral company. It was organised by the company concerned and attended by all their officers and cadets. Lectures and demonstrations were given by officers of the Sheep and Wool Branch in addition to officers from other Branches of this Department.

WOOL BIOLOGY LABORATORY.

Fleece measurement, which has now been carried out for six years, was well patronised during the past year as an aid to selection in breeding flocks. A total of 3,678 wool samples was scoured for percentage yield and clean scoured fleece weight in addition to measurements for fibre diameter, crimp and staple lengths on 1,600 samples. These figures are slightly lower than those for the previous year.

The drought conditions which existed in most areas probably caused graziers to greatly curtail their culling rates in order to maintain the numbers of their breeding flocks. This, together with changes in shearing dates due to dry conditions, could have had some bearing on the slight fall in samples.

EXTERNAL PARASITES.

The effectiveness of insecticides available for the control of body lice (*Damalinia ovis*) has been well demonstrated. The necessity for complete musters and the need for good fencing and other means to stop the mixing of clean and infested sheep is still as important as ever.

The leg itch mite (*Trombicula sarcina*) again appeared on black earth areas, but has now appeared somewhat further south, on the southern limit of the soil type to which it had previously been confined.

A greater number of cases of itch mite (*Psorergates ovis*) has been recognised than in previous years, and in

one instance a heavy incidence was found on a property where arsenical dips had been used for the previous six years. The parasite has now been recognised in areas as far north as Emerald, but the majority of cases have been found in the Warwick-Stanthorpe area. The only field treatment giving apparent control is lime sulphur, which has been applied successfully through shower dips. Sheep treated with lime sulphur show some discoloration at the tip of the wool staple for a few months but this discoloration rapidly regresses and almost disappears in 3–4 months.

BLOWFLY.

The lack of good rains curtailed the spring flywave in most areas, although some flystrike occurred in the dry area in the south-western district. These cases of flystrike occurred in sheep on which the Mules operation had not been done while on adjoining properties sheep on which the Mules operation had been done remained free of strike. During the autumn flywave isolated reports of the ineffectiveness of the chlorinated hydrocarbon insecticides used to control strikes were received. Field investigations have shown that up to four or more times the normal jetting strength failed to give protection against flystrike. Further investigations of this apparent resistance is necessary.

It is an opportune time to take stock of the means available to combat the blowfly menace. The Joint Blowfly Committee published its findings in 1940. These findings were:—

"The conditions essential for strike are:—

(i.) A sheep predisposed by breed and type.

(ii.) A favourable site, usually on the breech, where fleece and skin are affected by moisture with which are usually associated bacterial growth and inflammation of the skin.

(iii.) Flies are abundant and active. The proportion of susceptible sheep that become struck at any given time depends on the population of active, fertile female flies present at the time."

The methods of prevention were grouped under three headings:—

(1) Measures to reduce inherent predisposition.

(2) Measures to reduce immediate susceptibility.

(3) Measures to reduce fly abundance.

It was further emphasised that no method alone was completely successful—it was necessary to attack with all the above measures and finally to treat any strikes which did occur in spite of these methods.

The measures given to reduce predisposition were selection and breeding, the Mules operation and adequate docking of the tail.

To reduce immediate susceptibility, shearing, crutching and jetting were detailed and methods of reducing fly abundance were also given.

Since 1940 studies on genetics in the Australian Merino have shown that skin folds are highly inherited and plain-bodied sheep may be bred without loss of desirable wool and its characters. The usefulness of the Mules operation and the importance of correct tail length have been verified on both plain-bodied and wrinkly sheep.

The influence of shearing and crutching on the immediate susceptibility of sheep is well known, but these measures are perhaps temporarily set aside because of the long protection given by modern jetting fluids. New jetting materials found since arsenic was used have given such long periods of protection and control of the fly problem that the importance of other methods have been overshadowed.

BHC as a jetting fluid was soon followed by DDT, aldrin and dieldrin, all members of the group of chemicals known as chlorinated hydrocarbons. Later, some members of the chemical group known as organic phosphates were found suitable and effective for application as a jetting fluid in blowfly control.

The ability of some of these insecticides to kill blowfly larvae on the sheep as well as give the struck sheep long protection after treatment was a major step forward. Their low toxicity for sheep allowed struck sheep to be jetted in a race with unstruck sheep instead of being drafted off and dressed by hand. This has given a big saving in labour.

Should the chlorinated hydrocarbons become ineffective against blowfly, it is likely that some organic phosphates will continue to prove effective for some time. But for how long? Already some resistance to some organic phosphates has been reported in houseflies in overseas countries. The implication is that it is necessary to adhere to a plan—breeding sheep to reduce their inherent predisposition to strike, docking lambs' tails to correct length, performing the Mules operation to reduce their susceptibility, as well as shearing and crutching just prior to anticipated fly waves. Jetting with an effective and economical jetting fluid to supplement the above measures when a fly strike commences or is anticipated should be done. The time of jetting will depend on the period of protection given by the jetting fluids available.

INTERNAL PARASITES.

Internal parasites, particularly the barber's pole worm (*Haemonchus contortus*), have become widespread during the last few years. The mean monthly maximum temperature of all the sheep areas of Queensland with the exception of the Warwick-Stanthorpe area is high enough during all months of most years for an outbreak of barber's pole worm. In most years, rainfall (moisture) only is missing. The rain falling during June 1957 appears to have been sufficient to cause a marked increase in barber's pole worm infestations in the central and northern districts. Treatments with available anthelmintics have been effective once the problem has been recognised. However, in many cases, the worm infestation has been present but the problem has not been recognised, in spite of many attempts through press and radio to inform graziers of the danger.

FERTILITY.

The average lambing percentage in Queensland is low and is one of the sheep industry's most pressing problems.

Low lambing percentages do not allow sheep numbers to be kept up sufficiently to permit an effective level for culling to be used. Further, they do not allow a quick build-up to the average stocking rate after a drought. Lambing percentages are generally expressed as the number of lambs marked to ewes mated. This takes into consideration the ability of the ewe to bear a lamb and feed it to marking age, and also the lamb's ability to suckle and obtain sufficient nutrient to reach that age while at the same time evading predators. There are, of course, many factors influencing the percentage of lambs marked. The ram must be fertile. The ewe must conceive and carry the lamb to birth, it must produce milk for the lamb at birth, and the lamb must be strong enough to take the milk at birth. The recent dry spell in the southern sheep districts has emphasised the importance of feed during the later portion of pregnancy. Not only did many lambs die because the ewe did not produce milk for them, but many ewes themselves died from pregnancy toxaemia.

Rearing the lambs to marking age therefore requires attention to many different aspects of husbandry. A fertile ram or a ewe with a good supply of milk, good mothering quality, and a lamb at foot is not of much use if the lamb is lost through lack of good husbandry at a later date. Attention to the correct methods of sheep husbandry cannot be over-stressed, especially so far as the breeding flocks are concerned, if lambings are to be increased.

Effects of Thyroxine on Fertility.

In the last report mention was made of an experiment carried out in this connection. Some additional information on the ewes is now available. During the joining period of three weeks, 95 per cent. of the ewes were served (marked by the raddled rams), while 57 per cent. were judged to have conceived (not marked by raddled teasers during the subsequent three weeks'

period). On a wet and dry basis three weeks before lambing was due to commence, 43 per cent. of the ewes were showing in lamb and subsequently 30 per cent. of lambs were marked. This is an apparent fall of 27 per cent. between conception and marking and is similar to that found in the nucleus flock at Toorak Field Station, which is lambed under surveillance.

Effect of Thyroxine on Wool Growth.

The effects of thyroxine on the wool growth and body weight were also studied with Peppin strain Merino wethers under field conditions at the Toorak Field Station. The wethers (1954 drop) were divided into two groups, one treated with 60 mg. of L. thyroxine on Dec. 27, 1956, and the other kept as an untreated control group. Wool production per unit skin area was measured by taking clippings on the day of treatment on Apr. 4, 1957, and again at shearing during the first week in July 1957. Fleece weights were obtained at the July shearing. Body weights were also taken at these times. The observations were based on groups of 36. The body weights were as shown in Table 1.

TABLE 1.

EFFECT OF THYROXINE ON BODY WEIGHT.

—	Body Weight 27/12/56.	Body Weight 4/4/57.	Body Weight First Week in July, 1957.
	lb.	lb.	lb.
Treated Groups ..	102 ± 2	100 ± 2	87 ± 2
Untreated Group Controls ..	104 ± 2	109 ± 2	94 ± 2

There is evidence of a significant body weight depression in the treated sheep. No significant differences were found in wool characters, although fairly large differences would have been required on the small numbers involved.

Lambing Performances of Nucleus Flock.

The nucleus flock at Toorak Field Station, comprising 420 Peppin ewes of varying ages, were joined to Peppin rams in March/April, 1957. Prior to joining, these ewes were divided into three groups.

Group A were selected at random. Group B comprised ewes selected for good wool production and previous high fertility records. Group C comprised those rejected for low wool production and low fertility records.

All ewes were joined with rams which had been examined and appeared to be fertile on semen examination. The joining period extended from Mar. 28 to Apr. 21, a period of 24 days.

The percentage of ewes which lambed expressed as a percentage of ewes joined for the whole flock was 47.5. The percentage of lambs marked as a percentage of ewes joined was 31.

When broken up into the selected groups, the results were as shown:—

(1) *Ewes lambed as percentage of ewes joined.*—
Group A (random selected) 49.
Group B (selected for high fertility and wool production) 55·5.
Group C (selected for low fertility and wool production) 37.

(2) *Lambs marked as percentage of ewes joined.*—
Group A (random selected) 30.
Group B (selected for high fertility and wool production) 38.
Group C (selected for low fertility and wool production) 25.

When the ewes were joined the feed available was good, but it deteriorated badly during gestation and the ewes were lambed on a low plane of nutrition. The average birth weight of lambs was 7½ lb., which was ½ lb. lighter than the average for the previous year. The loss of lambs between lambing and marking was 40 per cent., twice as heavy as that experienced in 1956, but similar to losses found on properties in adjoining districts in previous years. Lambs which survived to marking gained weight during the period at a rate of ¼ lb. per day. This is half the daily rate of body weight gain found in the previous year and is an indication of the dry seasonal conditions. Single lambs were 2·1 lb. heavier at birth than twins. Male lambs were only 0·2 lb. heavier than females. Of 19 sets of twins born, both lambs did not survive in any instance.

The autumn joining of this flock in 1958 was designed to obtain more information in respect of the conception rate of ewes under north-western Queensland conditions.

Before joining, all rams were manually palpated for abnormalities of the testicles. Semen samples were then collected by electrical stimulation and examined for pH, sperm motility and abnormal spermatoza. Semen smears were also taken for examination for *Brucella ovis*. The whole of the 726 ewes now available in the flock were used in this trial. These ewes were run in a small paddock and mustered into holding yards early each morning, where they were joined with raddled teasers for one hour, after which the marked ewes and teasers were drafted off. The marked ewes were then joined in small pens with a fertile ram until a successful service was considered to have taken place. This procedure was followed for a period of six weeks, after which the ewes were run with teasers only for a further three weeks.

Of the total flock of 726 ewes, 614 were detected in oestrus by the method used and served by fertile rams, and it appears that 405 of these are now in lamb. This is 56 per cent. of the flock, or 66 per cent. of the ewes served. These apparent conceptions are based on the failure of the mated ewes to show oestrus to the teasers during a period of at least three weeks following mating.

REPEATABILITY.

If sheep are to be classed into a flock because they are superior in one or more measured characters, it is essential to know how much of their superiority is likely to persist through the remainder of their revenue producing lifetime. As a matter of policy, no culling is practised among the ewe portion of the experimental flock of medium Peppin strain sheep run on the Toorak Field Station. The results obtained from these sheep are, therefore, suitable for studying the adequacy of single or repeated measurements as a basis for selection.

Repeatability is measured on a scale from 0 to 1. A value of 1 indicates that the results from a single year are a perfect guide to those to be expected in subsequent years. A value of 0 indicates that there is no relationship at all from one year to another. The actual values obtained for a number of characters are as follows:

Character Measured.	Repeatability.
Greasy fleece weight	0·67
Yield	0·67
Clean fleece weight	0·66
Staple length	0·57
Crimps per inch	0·71
Fibre diameter	0·49
Variability of fibre diameter	0·43
Birthweight of offspring	0·43

These results are, broadly, similar to those which have been obtained by other Australian workers despite the differences in the semi-arid environment of north-western Queensland and the more favoured areas in which other research stations are situated.

RELATIONSHIP OF WOOL CHARACTERS.

The various wool characters which can be measured are not unrelated. It is important to know which characters are closely associated. If the correlation is sufficiently strong, it may be possible to dispense with one

of the measurements and use another as an approximation. Unless the culling rate is high, it is usually not necessary to measure clean fleece weight, greasy fleece weight being a sufficiently good guide. This does not apply to ram selection, where only a very small proportion of the available animals are finally selected and the utmost accuracy is required. On the other hand, the number of crimps per inch is, contrary to popular opinion, a rather poor indication of fibre diameter.

It is also necessary to consider whether selection for one character is likely to result in undesirable changes in another character. There is a moderately strong negative relationship between fleece weight and crimps per inch, so it is necessary to strike a balance between these two conflicting characters.

The correlations between wool characters measured in the Field Station flock are shown in Table 2 (correlation, like repeatability, is measured on a 0 to 1 scale, 1 indicating perfect association). They are again comparable with values previously published for the Australian Merino in a more favourable environment.

TABLE 2.

Correlation Between Wool Characters.

Character.	Greasy Fleece Weight.	Yield.	Clean Fleece Weight.	Staple Length.	Crimps per Inch.	Fibre Diameter.	Co-eff. of Variation of Fibre Diameter.	Body Weight.
Greasy fleece weight ..	..	0·10	0·85	0·41	—0·33	0·47	0·12	0·24
Yield	0·10	..	0·56	0·34	—0·39	—0·04	0·16	0·13
Clean fleece weight ..	0·85	0·56	..	0·51	—0·46	0·04	0·13	0·26
Staple length	—0·41	0·34	0·51	..	—0·35	—0·13	0·02	—0·00
Crimps per inch ..	—0·33	—0·39	—0·46	—0·35	..	—0·23	—0·25	—0·00
Fibre Diameter ..	0·07	—0·04	0·04	—0·13	—0·23	..	—0·03	0·11
Co-efficient of variation of fibre diameter ..	0·12	0·16	0·13	0·02	—0·25	—0·03	..	—0·08
Body weight	0·24	0·13	0·26	—0·00	—0·00	0·11	—0·08	..

CATTLE HUSBANDRY BRANCH.

Mr. D. N. Sutherland, Director of Cattle Husbandry.

The seasonal conditions of 1957 assumed drought proportions late in that year throughout all the dairying and beef cattle districts. Rains late in January relieved the position in coastal and sub-coastal districts, but it was not until general unseasonal rains fell in June that the drought was broken in more inland areas. The far south-west did not receive these rains and a serious drought situation prevailed there at the end of June.

The unfavourable weather of 1957-58 naturally had serious effects on the livestock industries and heavy losses of stock and production occurred.

PRODUCTION TRENDS AND MARKETS.

Dairy Industry.

The loss of production and cattle caused by the drought during the year is a matter of serious concern to the dairy industry and to the State. Of equal, if not greater, importance are the long-term trends within the industry in both production and marketing. Unlike most of Queensland's other primary industries, the dairy industry has not shown any increase in output per animal unit over the past 20 years. Total dairy cow population and total output of dairy produce have shown very little variation since pre-war years, indicating that the level of production of milk and butterfat per cow is not increasing. In an age when advances in technical knowledge make possible increases in unit output of all primary products, the position within the Queensland dairy industry gives cause for serious concern. In other States of Australia and in other major dairying countries of the world, output of dairy produce per cow has shown a continued upward trend over the past 10 years.

Increasing production in all dairying countries has resulted in over-supply of dairy produce on Australia's main overseas market, the United Kingdom, with a serious decline in the return to Australian dairy farmers for butter exported to that market. Under present highly competitive conditions for marketing of dairy products, Queensland producers are at a serious disadvantage because of high costs of production, which are due in a large measure to low level of production per cow.

Increased production per cow under Queensland conditions can be achieved by an improvement in the feed supply available to dairy cattle throughout the year. On many farms this objective can best be achieved through the use of irrigation, and experience in recent years both on Departmental stations and on privately owned farms has shown that high levels of output can be obtained in Queensland by this means. There can be little doubt that where it is practicable, the use of irrigated pastures for dairy production on small holdings is the most economical method of improving production under Queensland conditions.

On farms where irrigation is not practicable the raising of the plane of nutrition of dairy cattle can best be achieved through the combined use of improved pastures, grazing crops and fodder conservation. Under present-day conditions the implementation of these practices calls for use of mechanical equipment on a large scale. The need for mechanisation as an aid to increasing production per cow and reducing unit cost of production will probably lead to a change in the pattern of farming in Queensland dairying districts, with an increase in size of individual farms. This trend is already in evidence in other parts of the world and in other States of Australia and there is no reason to believe it will not occur in Queensland.

While increase in output per cow must be the objective of each individual farmer in his efforts to increase efficiency, an overall increase in the State's output of butterfat could have adverse effects on the price paid to the farmer for butter. For this reason, a diversification of farm production is desirable in those dairying districts where it is practicable.

Beef Industry.

While serious losses of cattle because of drought conditions were recorded on some properties in the spring and early summer of 1957, overall losses were much lower than in comparable droughts in 1945-46 and 1951-52. There can be no doubt that the reduction in losses was due largely to the extensive improvements effected on most properties since the end of the war.

In the years immediately following the war, fears were expressed in some quarters that Australia may face a shortage of beef by 1960 because of rising population. These fears have proved to be groundless, as production of beef throughout the country has increased over the past seven years at a much greater rate than the demand for home consumption. In consequence, the amount of beef available for export has increased steadily and in 1955-56 and 1956-57 it was substantially greater than the amounts exported in pre-war years.

Although the drought in 1957-58 caused some decline in production, it is considered that the level of output of the beef industry will continue to increase for some years to come if prices can be maintained at satisfactory levels in relation to costs.

Under the 15-Year Meat Agreement, Australia has a market in the United Kingdom for all its surplus beef for a number of years. However, the increasing supplies of beef now coming on to that market from all sources will almost certainly have a depressing effect on prices. In 1955, total supplies of meat on the United Kingdom market rose above the 1938 level for the first time and they increased still further in 1956. In both of these years the consumption of meat per head of population in the United Kingdom exceeded slightly the pre-war levels of consumption.

In addition to its influence on price levels generally, the meat supply position in the United Kingdom has led to increasing discrimination in regard to quality in beef. The type of beef most in demand—and for which a premium price is paid—is from cattle fattened at less than three years of age and without excessive fat. Queensland beef producers are at a disadvantage in comparison with producers in the United Kingdom, the Argentine and New Zealand in the production of this class of beef because of adverse environmental conditions. Nevertheless, the type of beef required can be produced in greatly increased quantities in large areas of southern and central Queensland and in some areas on the Far North Coast. Over recent years the production of this class of beef has increased considerably, particularly in southern Queensland. The decision to pay a premium of 2d. per lb. on beef of the desired quality from younger cattle should further stimulate the move to turn off cattle at an earlier age.

EXTENSION WORK.

Producers in both the dairy and the beef industries are showing an increasing awareness of the need to apply scientific findings to their businesses. There is evidence of a desire to understand the principles of animal production. This is shown by the enthusiastic response by producers to a series of schools held during the year.

Producer schools in which Branch personnel took an active part were one each at "Canobie" (Cloncurry district), Townsville and South Johnstone for beef producers; and four on the Atherton Tableland, and one each at Gympie, Kingaroy, South Johnstone, and Daintree, for dairy farmers. It is considered that this method of extension is likely to become more prominent in future.

While producers are active in seeking scientific knowledge, an increasing volume of such knowledge is becoming available as a result of studies and investigations in the Queensland environment. During the last five years this Branch has obtained local data on the following aspects of beef production:—

(1) Growth rates of beef cattle in various districts.

(2) Growth rate performance on improved pastures and crops.

(3) Performance of cattle of different breeds in various environments of the State.

(4) Breeding performance, reproductive data, etc., from the "Brian Pastures" herd.

(5) Feeding of cattle on low-quality roughage and the effect and value of supplements to same.

In dairy husbandry, studies of herd recording data in relation to the production of stock under various feeding conditions are providing valuable local information. The herd breeding survey is yielding facts on the hitherto recognised but undefined problem of infertility. Detailed recording of all husbandry factors in herds at Regional Experiment Stations is providing a body of local quantitative data.

A most noteworthy development during the past year has been the activities of several producer groups in the field of artificial breeding of dairy cattle. The most advanced with plans at this stage is the Atherton Tableland Co-operative Artificial Breeding Association. Technical advice by the Branch has been provided to the Association in its planning stages and its inseminators have received training from skilled Branch officers. Jersey and A.I.S. semen will be supplied from the small artificial breeding unit recently established on the Kairi Regional Experiment Station. In the months after field operations commence there will no doubt arise a variety of problems, some of a technical nature, others in the field of organisation. Technical assistance will be maintained to the Association.

This example of co-operation between a large number of producers on the one hand, and between producers and the Department on the other hand, warrants a study of methods. Experience on many past occasions has been that this joint approach to dairy industry problems is the one that yields greatest dividends in the long run.

BEEF CATTLE INVESTIGATIONS.

"Brian Pastures" Research Station.

Drought conditions prevailed at "Brian Pastures" Research Station from June 1957 to mid-January 1958. Total rainfall recorded at the Station for 1957 was 9.11 in. This is less than one-third of the district average as recorded at Gayndah Post Office.

Native pastures were very low in quality in late winter. A limited quantity of green feed was available for a short period in early spring. Comparatively light falls of rain provided temporary relief in November but there was an acute shortage of pasture during December and early January.

The performance of the stock under conditions of drought stress was satisfactory and no losses occurred as a result of drought. All classes of stock remained in strong condition despite weight losses and responded remarkably well to the favourable pastoral conditions ruling since the end of January.

Effect of Drought on Growth Rate of Yearling Steers.—Plate 1 shows the performance of yearling steers for the years 1955, 1956 and 1957. The net weight gain

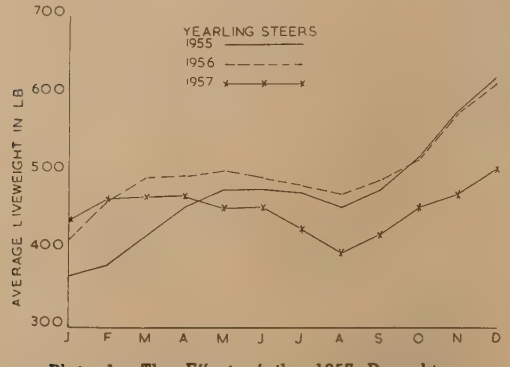


Plate 1.—The Effect of the 1957 Drought on Growth Rate of Yearling Steers is Evident from this Graph.

of this class of cattle for 1957 was 68 lb., compared with 257 lb. and 202 lb. for yearlings in the years 1955 and 1956 respectively.

General Management and Prevention of Losses.—Weaning was carried out in July, which is about one month earlier than normal. It is unlikely that calves born in summer are obtaining appreciable quantities of milk from the dams by July, when pasture conditions are bad. Segregation facilitates better management of both groups and permits effective supplementary feeding.

Weaners were given a supplement of crushed grain sorghum at the rate of 2 lb. per head per day from mid-July to mid-October. This allowed small weight gains to be made and was responsible for the weaners reaching weights by March which were equivalent to those recorded for previous groups. The comparative performance of the 1955, 1956 and 1957 groups of weaner steers is shown in Plate 2. Weights are shown from September (post-weaning) to March. The effect of drought

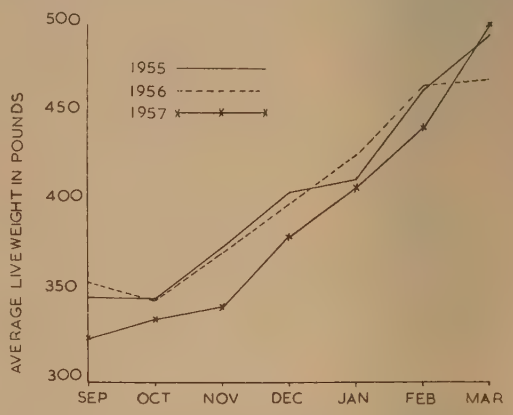


Plate 2.—A Small Supplement of Crushed Grain Sorghum from Mid-July to October enabled 1957 Weaners to reach Normal Weight by March.

is reflected in the lower weight of the 1957 group in September, when it averaged 324 lb., compared with 347 lb. and 356 lb. for the 1955 and 1956 groups. The weight of 500 lb. in March attained by the 1957 groups was higher than for either of the previous groups.

Weighing and Liveweight Records.—From information obtained by regular weighing of cattle in the past four years a clear picture of seasonal growth rates has emerged. Irrespective of seasonal conditions, the growth pattern of cattle grazing native pastures in the Central Burnett does not vary appreciably. Seasonal conditions influence the duration of each period. The broad pattern falls into three periods:—

(1) Productive weight gain from mid-November to mid-May.

(2) Weight loss from mid-May to the end of August.

(3) Unproductive weight gain from the end of August to mid-November.

Comparative Performance of Weaners and Yearlings.—The weight gain performance of weaners and yearlings is shown in Table 1. The period relates to the 12 months following weaning:—

TABLE I.

WEIGHT GAINS BY WEANERS AND YEARLINGS.

—	Liveweight.		
	September.	Following August.	Gain for 12 Months.
	lb.	lb.	lb.
1955–56—			
Weaners ..	347	473	126
Yearlings ..	479	711	232
1956–57—			
Weaners ..	356	428	62
Yearlings ..	491	645	154

The low weight gain made by weaners points to an aspect of beef cattle production which calls for attention. It would appear that native pastures are lacking in quality for this class of animal. Where supplements are to be fed or improved pasture or crop made available it would seem that weaners are the most economical animals to feed.

Hormone Implant Trial.—A trial to determine the effect of hormone implantation on weight gains of pasture-fed fattening bullocks was carried out. Details and results from this and other trials are collated in a later section.

Analysis of Production Performance Records.—An analysis has been carried out on the data collected in the years 1954, 1955 and 1956 in relation to birth weight of calves and growth rate of calves from birth to weaning.

The average birth weight of 424 calves dropped was 71 lb., the range being 40 lb. to 98 lb. The average for 219 males was 74 lb. and for 205 females 68 lb. The difference in birth weight between the sexes was highly significant. Heavier cows bore heavier calves. A difference of 100 lb. in liveweight of the cow resulted in an increase of approximately 2½ lb. in the birth weight of the calf.

The time of calving each year is spread over a period of 10 weeks. Calves born towards the end of the period were heavier than those born at the beginning, the increase in birth weight of calves being of the order of 5 lb. for each month.

Calves from first-calf heifers were generally smaller than those from older cows, but the data did not show a significant effect of age of cow on birth weight.

Approximately 19 per cent. of the variation in birth weight of calves was accounted for by variation in the weight of dam and time of calving.

For 407 calves recorded from birth to weaning the average rate of gain was 1.46 lb. per day, with a range of 0.69 lb. to 2.25 lb. The average for 208 males was 1.59 lb. and for 199 females 1.43 lb. Birth weight had a significant effect on growth rate, heavier calves at birth having a higher growth rate. Time of calving, weight of dam and birth weight of calves accounted for approximately 12 per cent. of the variation in growth rate.

Sufficient data will be available in the coming year to permit an analysis of factors affecting growth rate after weaning and to enable the repeatability of a cow's calving performance from year to year to be studied.

Bureau of Tropical Agriculture, South Johnstone.

Production of Chiller Grade Carcases.—The value of improved pastures on the tropical north coast has been demonstrated in the past in fattening cattle 2-3 years of age. A trial recently concluded indicates that younger cattle can be fattened successfully.

Early in 1957, 40 head of yearling steers were obtained from the Mt. Garnet district. The steers were of Devon x Shorthorn breed and were 14 months of age on arrival on the coast. After 13 months on improved pastures, the top 20 head were sold for slaughter. The average dressed weight was 572 lb. with a grading of 77.5 per cent. chiller and 22.5 per cent. first grade. The dressing percentage was 57 per cent. based on empty liveweight. The average gain per day on the coastal pastures was 1.30 lb., with a range of 1.02 lb. to 1.65 lb.

These cattle settled down quickly to coastal conditions and appeared to suffer little setback when being transported to the coast by road and rail.

Comparison Between Inland and Coastal Pastures.—The value of coastal improved pastures in the early turn-off of cattle was demonstrated in a recent trial.

Following regular weighing of a group of steers at "Wairuna", 75 miles south-east of Mt. Garnet, the steers were paired on weight performance and one member of each pair formed a group which was taken to the coast in January, 1957. At this time the steers averaged just over two years of age. They comprised both Brahman cross and British-breed animals.

The performance of the two groups is shown graphically in Plate 3. The coastal group suffered a loss of weight in transit but reached the weight of the station

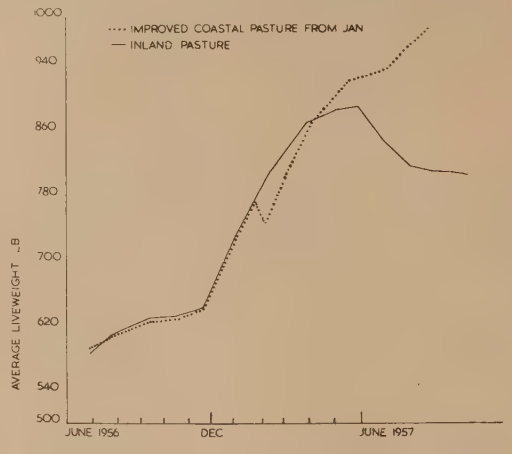


Plate 3.—Steers from an Inland Area moved to Coastal Pastures in January, 1957, reached Slaughter Weight by August.

group again in 70 days. In May the coastal group showed to advantage and continued to gain weight until slaughter in August 1957. Liveweight then was 985 lb., compared with 806 lb. for those at "Wairuna". The latter group will have to be held for another one and probably two years on inland pastures before they reach a suitable stage for slaughter.

Trials on Private Properties.

Economics of Crop Fattening.—The current demand for a young, lightweight beef carcase has placed emphasis on methods of producing such a carcase. Fattening on crop or improved pastures possesses possibilities of large-scale development in Queensland.

In co-operation with the Commonwealth Bureau of Agricultural Economics, 13 projects on crop fattening have been planned. The primary aim is to assess the economics of crop fattening. Weight gains of cattle on crop will be determined by the use of mobile weighbridges. Of the 13 properties concerned, six are in the Burnett area, six on the Darling Downs and one in Central Queensland.

Fattening at Early Age.—The fattening performance of three groups of steers in different parts of the State is shown in Table 2. In all cases the carcases were regarded as suited to present-day requirements. The results illustrate the possibilities which exist for turn-off of young stock in widely separated districts.

TABLE 2.

EARLY FATTENING OF CATTLE.

District.	Type of Feed.	At Turn-off of Steers.			
		Age.	Live Weight.	Dressed Weight.	Dressing Percentage.
		Months.	lb.	lb.	
Miles	Crop (mainly oats)	24	961	Unobtainable	
Texas	Improved Pasture (temperate species)	28	974	555	57
Innisfail	Improved Pasture (tropical species)	27	1,004	572	57

Milk Production of Beef Cows.—A trial was commenced in the Rockhampton district to determine the milk production of beef cows. Observations have revealed that in November 1956, the milk yield of 19 Hereford cows averaged 12.4 lb. per cow daily. Six months later (May 1957) two cows were dry and the average daily milk production of the remaining 17 head was 2.9 lb. The only two cows producing over 4 lb. daily were subsequently shown to be not in calf again. By May, the cows were also losing body weight.

Drought Feeding Trials.—The drought conditions afforded an opportunity to test the value of bush hay (hay made from native pastures) as a drought feed for breeders. Work in the Central Highlands revealed these points:—

(1) Cows receiving hay + molasses + urea maintained body weight and their calves made fair gains.

(2) Hammer-milling of hay apparently did not increase consumption.

(3) Under conditions of stress, deaths occurred in cows sooner than in calves.

(4) It would appear that the urea was responsible for the greater intake of hay by the hay-molasses-urea group.

(5) Non-fed breeders with calves lost an average of 0.34 lb. per day over a period of four months.

Hormone Implant Trials.—The use of synthetic hormones in fattening cattle has attracted considerable interest. It has been estimated that approximately 70 per cent. of all beef cattle on feed in the United States of America now receive feed supplements containing hormones. It is stated that hormones given daily in the ration have been responsible for an 18 per cent. increase in rate of gain and a feed saving of 12 per cent. in lot fattening of cattle. Trials there have indicated that the response to implants is less than to daily feeding of hormone and also that animals on pasture do not respond as well as those in feed lots.

Beef cattle in Queensland are fattened on pasture or crop and the implantation method would appear to be most practicable. The results of trials conducted with this method are summarised in Table 3. Where comparisons have been made, results indicate that no advantage is obtained from a dosage exceeding 30 mg. hexoestrol. Undesirable side-effects such as conformation defects have been noticeable in some instances, particularly at the higher dose rates.

Where it has been possible to observe carcase results, differences in carcase conformation have not been statistically significant.

It is clear that further work is required under Queensland conditions before definite recommendations can be made. At present it would appear that the use of hormone implants should be restricted to fattening bullocks on a high plane of nutrition which will be slaughtered within 150 days of implantation.

DAIRY CATTLE INVESTIGATIONS.

Infertility Survey.

The Commonwealth Dairy Industry Extension Grant, recently extended by the Commonwealth Government for a further five years, is the source of funds for a detailed study of the incidence of infertility in the dairy cattle of the State and the pattern of reproductive behaviour and the causes of sterility in the State's dairy herds.

The field study is made on the breeding performance records kept by dairymen throughout all dairy districts of the State. Much of the credit for the success so far achieved in this work must be given to these men. The records required are lengthy and precise and a high degree of vigilance in herd observation and enthusiasm for the work over a number of years is essential for accuracy. The standards on these matters achieved by the 130 dairymen participating in the survey have been high.

The bulk of the data is being prepared for automatic treatment on sorting and tabulating machines. In the meantime, preliminary herd breeding data for a number of regions within the State have been assembled. This information is circulated to local field officers and co-operating dairy farmers in each region as a starting point for extension and technical programmes of control.

By way of review, these analyses indicate:—

(1) At least 40 per cent. of herds have breeding troubles of one type or other.

(2) About 25 per cent. of the cows of the State herd take over 13 months to re-calve.

(3) The number of services per conception and the conception rate for the State are below desirable standards.

TABLE 3.

Results of Hormone Implantation Trials.

District.	Available Feed.	Type of Animal.	Treatment.	Length of Trial. (days)	Liveweight (lb.). Initial.	Liveweight (lb.). Final.	Gain (lb.).	Liveweight Advantage in favour of Treated Stock. (lb.)
Darling Downs ..	Grazing oats and native pastures	2½- to 4-year-old bullocks	(*a*) 200 mg. progesterone + 25 mg. oestradiol benzoate	56	878	1,055	177	25*
			(*b*) Control		906	1,058	152	
Central Queensland— (1)	Native and improved pastures	3-year-old bullocks	(*a*) 15 mg. hexoestrol	125	913	1,029	116	33**
			(*b*) 30 mg. hexoestrol		870	985	115	32**
			(*c*) 45 mg. hexoestrol		886	976	90	7
			(*d*) Control		907	990	83	
(2)	Native and improved pastures	4-year-old bullocks	(*a*) 15 mg. hexoestrol	99	1,162	1,277	115	23
			(*b*) 30 mg. hexoestrol		1,171	1,274	103	11
			(*c*) 45 mg. hexoestrol		1,210	1,308	98	6
			(*d*) Control		1,128	1,220	92	
(3)	Native and improved pastures	(*a*) 2-year-old bullocks	(*a*) 15 mg. hexoestrol	96	701	863	162	13
			(*b*) 30 mg. hexoestrol		754	929	175	26**
			(*c*) Control		727	876	149	
		(*b*) 3-year-old bullocks	(*a*) 15 mg. hexoestrol	96	945	1,097	152	25
			(*b*) 30 mg. hexoestrol		1,034	1,165	131	4
			(*c*) Control		968	1,095	127	
Far North Queensland	Improved tropical pasture	2- to 4-year-old bullocks	(*a*) 60 mg. hexoestrol	102	813	1,018	205	35**
			(*b*) Control		825	995	170	
Central Burnett "Brian Pastures" Research Station	Native pastures	2- and 3-year-old bullocks	(*a*) 30 mg. hexoestrol	159	744	1,022	278	32**
			(*b*) 60 mg. hexoestrol		752	1,021	269	23**
			(*c*) Control		751	997	246	

* Not analysed statistically.
** Difference significant.

In Table 4 the conception rate at first service and the number of services per conception are shown for several districts for each of two years. It will be noted that appreciable differences in fertility occur between areas and between years.

TABLE 4.

Conception Data for Various Districts.

District.	Conception Rate.		Services per Conception.	
	1953.	1954.	1953.	1954.
	%	%		
Moreton—				
Far South Coast	68·9	69·0	1·51	1·59
South Coast ..	58·8	65·7	1·90	1·70
Central ..	67·6	57·0	1·56	1·79
Near North ..	46·9	57·2	2·39	2·00
Burnett	60·6	66·0	1·63	1·51
Darling Downs ..	54·6	63·9	1·95	1·57
Central Coast ..	49·1	..	2·28	..
Atherton ..	52·4	42·8	2·14	2·57

The situation on individual farms within a particular district shows a greater degree of variation than these average figures for groups of farms within a district. This is clearly indicated by comparing conception rates and services per conception over a 2-year period in five of the surveyed herds of the Atherton Tableland (Table 5).

TABLE 5.

Conception Data for Five Atherton Tableland Herds.

Herd.	Conception Rate.		Services per Conception.	
	1953.	1954.	1953.	1954.
	%	%		
1	63·6	78·1	1·65	1·25
2	77·8	41·7	1·22	1·91
3	67·3	31·7	1·55	3·35
4	55·3	7·9	1·63	4·42
5	27·2	37·3	3·34	2·87

In Herd 1 breeding performance was substantially improved. Herds 2, 3 and 4, affected by an infectious reproductive disease during this period, showed a phenomenal decline in fertility. Herd 4, already affected by disease, maintained a poor level of breeding performance.

During the course of the analyses of the breeding survey a substantial volume of records of gestation length of Australian Illawarra Shorthorn cows became available. A report of this study was published in the *Queensland Agricultural Journal* of January 1958. It is believed that these are the first published data of this nature for this Australian developed breed of dairy cattle.

Proving Dairy Bulls.

A.I.S. Breed.—The necessity to meet future needs of the dairy industry for bulls of proven merit that would be suitable for use in artificial breeding programmes has been long recognised. Plans are being made for a project designed to prove bulls of the A.I.S. breed. A similar basic plan to that laid down in 1955 for the Jersey breed in the Nambour-Maleny area will be used, as this plan has given promise of satisfactory results. Several dairying areas were examined as to suitability for A.I.S. operations, and the Nanango-Kingaroy area was selected.

Jersey Breed.—The artificial breeding season commenced on Oct. 1, 1957 in this long-term project in the Maleny-Nambour area. As in previous seasons, four young Jersey bulls, located at the Animal Husbandry Research Farm at Rocklea, were used. Semen was railed three times weekly to Nambour.

An important feature of this, the third season of operations, was that the first group of bull-proving heifers attained breeding age. Severe drought conditions preceded and extended into the breeding season.

In the report for 1956-57 reference was made to the pre-natal wastage that occurred following the 1955 insemination season. During the first season 1,223 cows were inseminated and 369 heifer calves were subsequently born alive. Data on the post-natal wastage of these heifers are shown below. The causes of death listed are farmers' diagnoses, but in many cases it is known that the diagnoses are accurate.

Data lost*	13
Killed (badly developed)	6
Killed (overstocked)	6
Died 3 days after birth	1
Salmonellosis	1
Blackleg	3
Blood scours	1
Pneumonia	2
Tick fever	2
Three-day sickness	1
Lungworm	4
Worms	3
Scrub tick	3
Insecticide	5
Noogoora burr	2
Accident	2
Sunstroke	1
Drought	4
Snake-bite	2
Unknown	15
Total	77

* Two farms were sold and accurate details of the calves were lost.

After discussion with the co-operators, particularly in relation to the rate of growth of the heifers, it was decided to commence inseminating them on Nov. 1, 1957. It was considered that 250 heifers were available for breeding at that time.

Early in December more than 1,000 cows had been inseminated for the proving of the third set of bulls. However, by then only a few more than 50 heifers had been inseminated. It is probable that the poor sexual development in a high proportion of the heifers was due to seasonal effects. The insemination period for the heifers was extended into January in the hope that the anticipated improvement in seasonal conditions would stimulate reproductive activity. However, no such response was noted. Artificial induction of oestrus was practised on a large scale and reproductive activity was initiated in a number. By Feb. 15, only 105 heifers had been inseminated and it was considered impracticable to extend the season further.

The insemination data on these 105 heifers are classified in Table 6.

TABLE 6.

Insemination Data for 105 Jersey Heifers.

Insemination.	Number Inseminated.	Number of Non-returns in 60-90 days.	Conception Rate.
			Per cent.
First ..	105	56	53·3
Second ..	39	20	51·3
Third ..	16	4	..
Fourth ..	8	3	..
Fifth ..	4	..	..

Although the heifers were of fair general development, is was found on examination that very often their genitalia were quite infantile. Commonly a small luteal cyst was palpated on one or both ovaries.

The wastage in the second set of bull-proving heifers (those born in 1957) will yield further information on the degree to which heifer wastage is a limiting factor in this technique of sire evaluation.

Although reproductive function was depressed in the heifers, and although there was a wide distribution of anoestrous in the mature cows, the rate at which the cows were offered for insemination did not reflect any marked dysfunction in reproductive activity.

The insemination data in Table 7 have been obtained from the programme relative to the older cows. Once again the data are presented on the basis of 60-90 days non-return to service.

TABLE 7.

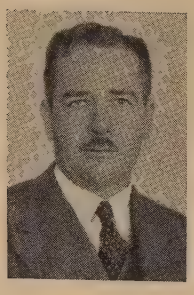
INSEMINATION DATA FOR OLDER COWS.

Insemination.	Number Inseminated.	Number of Non-returns in 60-90 days.	Conception Rate.
			Per cent.
First ..	1,424	742	52·1
Second ..	573	315	55·0
Third ..	198	96	49·5
Fourth ..	71	39	54·9
Fifth ..	13	6	..
Sixth.. ..	3	..	..
Total ..	2,282	1,198	52·5

It is unfortunate that the fertility level declined so markedly in the past season from conception rates of 64 per cent. in 1958 and 62 per cent. in 1955. It is undoubtedly a matter related to the seasonal effects operating during 1957, but the nature and relative importance of contributing factors remains an important field for research.

PIG AND POULTRY BRANCH.

Mr. A. L. Clay, Director, Pig and Poultry Branch.



The year under review was the first full one since this Branch was constituted.

As foreshadowed in the 1956-57 report, the Pig Section and the Poultry Section have functioned as separate entities with guidance and direction being given at the Branch level. This arrangement is considered to have worked quite satisfactorily.

Both the pig and poultry industries experienced a difficult year. High grain prices as a result of drought conditions were the main factor. As usually happens in this situation, some producers, in both fields, left the industry. Nevertheless production was on the whole surprisingly well maintained.

Some measure of recovery on the part of both industries now seems assured, as the 1957-58 summer grain crops have exceeded expectations and a satisfactory wheat crop is in prospect.

Marketing prospects, however, must continue to cause concern and there is an urgent need to stimulate local consumption of both bacon and eggs.

Sectional reports by the Senior Husbandry Officers concerned—Mr. F. Bostock (Pigs) and Mr. F. N. J. Milne (Poultry)—follow.

PIG SECTION.

Production of pigs was at about the same level as for 1956-57, slaughterings being in the vicinity of 450,000 pigs.

Prices for baconer pigs fluctuated and marketing conditions and prospects have not been promising. While prices during the first quarter of the year were regarded by many producers as being only reasonably satisfactory, it was expected that requirements for the Christmas trade, which normally operates to the end of October, would heighten the demand for quality baconers and bring about an increase in the price offered; but instead a reduction from 2s. 1d. to 1s. 8d. per lb. dressed weight was made. Prices increased to 2s. 1d. per lb. late in 1957 but again fell to 1s. 8d. per lb. towards the end of the year under review.

During the first half of the year, prices in the Northern Pig Marketing Board's area remained firm at 2s. 3d. per lb. for first quality baconers, with a penalty of 3d. per lb. for second and inferior grades. However, during the last half of the year the price for first quality was reduced to 2s. per lb. dressed weight. Production in this area increased and grading remained around 92 per cent. first quality, except for the January-March period, when a decline to 75 per cent. for first quality baconers was recorded.

The Queensland Co-operative Bacon Association, Murarrie, amalgamated with a Victorian Company during the year to establish an Australia-wide company to be known as Australian Bacon Limited.

CARCASE COMPETITIONS.

The annual baconer carcase competitions sponsored by the Australian Meat Board again were not conducted in Queensland, because bacon factory representatives in southern Queensland indicated they were still not prepared to co-operate.

The cured baconer carcase competitions retained their popularity with country show societies. This type of competition is proving a very useful medium through which farmers are enabled to see for themselves the type and quality of the bacon produced from the pigs raised on their farms and to compare results with those of other producers.

DEPARTMENTAL STUDS.

The stud pig herds at the three Regional Experiment Stations—Kairi (Tamworth), Biloela (Large White) and Hermitage (Berkshire)—were maintained and all equipment kept in good condition, replacements and repairs being carried out where necessary.

UTILISATION OF MOLASSES BY PIGS.

These studies, which were carried out at the Kairi Regional Experiment Station, proceeded in two phases, the second phase being a replica of the first. In phase 1, 18 weaner pigs were randomly divided into three equal groups, and in phase 2, 15 pigs were similarly treated. All animals were housed under similar conditions in conventional-type finishing pens. In an attempt to prevent any pen benefit or bias, the groups were rotated from pen to pen after each weekly weighing period. The ration was fed twice daily in open troughs, group feeding being practised. The feedstuffs of the ration, including the molasses, were thoroughly mixed beforehand and stored in bins for use during the trial. Weekly weight and food consumption were recorded and all carcases were appraised by the Hammond system.

The experimental design is shown in Table 1.

TABLE 1.

EXPERIMENTAL DESIGN OF MOLASSES FEEDING EXPERIMENT.

Phase 1.	Phase 2.	Up to 100 lb. Liveweight.	Treatment.	From 100 to 200 lb. Liveweight.	Treatment.
Group 1	Group 4	20% molasses 17% crude protein 6% fibre	1	10% molasses 13% crude protein 9% fibre	2
Group 2	Group 5	10% molasses 17% crude protein 6% fibre	3	20% molasses 13% crude protein 9% fibre	4
Group 3	Group 6	20% molasses 17% crude protein 6% fibre	1	20% molasses 13% crude protein 9% fibre	4

The foodstuffs comprising the ration were meat-and-bone meal, maizemeal, lucerne hay and molasses. In Table 2 some details of the composition of these are shown along with the four rations employed in the experiment.

TABLE 2.

TREATMENTS EMPLOYED IN EXPERIMENT.

	Percentage Molasses.	Percentage Protein.	Percentage Fibre.	lb./100 lb.
Treatment 1—				
Molasses	20	..	..	20
Meat-and-bone meal	..	8·94	..	18·25
Lucerne hay	..	4·60	4·58	20·10
Maizemeal	..	3·41	1·41	41·65
	20	17·01	5·99	100·00
Treatment 2—				
Molasses	10	..	..	10
Meat-and-bone meal	..	1·15	..	2·36
Lucerne hay	..	7·2	7·07	31·04
Maizemeal	..	4·64	1·92	56·60
	10	12·99	8·99	100·00
Treatment 3—				
Molasses	10	..	..	10
Meat-and-bone meal	..	8·28	..	16·90
Lucerne hay	..	4·20	4·13	18·12
Maizemeal	..	4·45	1·86	54·97
	10	16·93	5·99	99·99
Treatment 4—				
Molasses	20	..	..	20
Meat-and-bone meal	..	1·78	..	3·65
Lucerne hay	..	7·58	7·45	32·71
Maizemeal	..	3·57	1·48	43·64
	20	12·93	8·93	100·00

Results.

The group weekly gain and weekly food consumption are presented in Table 4.

When the pigs weighed approximately 200 lb. liveweight, they were sent for slaughter and the carcases appraised by the Hammond system. Details of the carcase appraisals are shown in Table 3.

TABLE 3.

CARCASE APPRAISAL DETAILS OF MOLASSES-FED PIGS.

Group.	Ham.	Shoulder.	Streak.	Eye Muscle.			Backfat.			Body Length.			Leg Length.			Total.	Dressed Weight.	Grade.
				Pts.	A.M.*	S.M.†	Pts.	A.M.	S.M.	Pts.	A.M.	S.M.	Pts.	A.M.	S.M.			
Group 1—																		
122 ..	6½	5	9	22	47	53	17	46	59	20	786	785	1	602	549	80½	130	2
109 ..	7½	6½	7	18	44	54	14	26	21	14	809	835	3	593	574	70	158	3
108 ..	6½	5	7½	21	47	54	19	20	21	16	806	825	1	602	569	76	152	2
123 ..	7½	5½	8½	19	45	54	19	19	20	17	803	815	4	590	564	80½	148	2
121 ..	6	6	9	24	49	53	19	20	19	20	815	785	1	591	549	85	134	2
118 ..	4½	6½	10	22	48	54	12	26	20	15	790	815	1	597	564	71	146	3
Group 2—																		
125 ..	6½	5½	10	20	45	53	20	17	17	19	771	775	1	586	544	82	128	2
119 ..	6½	6	9	21	46	53	18	17	19	20	807	785	2	572	549	82½	130	2
111 ..	7	5½	9	28	55	54	16	25	21	19	822	825	2	585	569	86½	152	2
107 ..	6	6	8	16	42	54	20	20	20	12	775	815	1	597	564	69	146	2
117 ..	7	5	8½	18	44	54	17	24	21	20	826	825	1	606	569	76½	152	2
104 ..	6	5	7½	18	44	54	16	24	20	11	773	815	1	602	564	64½	146	3
Group 3—																		
106 ..	7	5	7	19	45	54	14	26	21	10	775	825	4	576	569	66	150	3
126 ..	7	6	9	22	48	54	19	20	21	17	811	825	1	603	569	81	154	2
124 ..	6½	6	8½	17	43	54	20	20	20	20	813	805	1	603	559	79	140	2
110 ..	6	4½	9½	23	49	54	17	18	21	12	788	825	1	613	569	73	152	2
105 ..	6½	4½	6½	20	46	54	16	25	21	12	786	825	1	600	569	66½	150	3
120 ..	6½	4½	8½	17	42	53	19	20	19	9	730	785	1	580	549	68½	133	1
Group 4—																		
141 ..	6	6	8½	22	47	53	18	21	19	19	792	795	1	600	554	80½	138	2
152 ..	6½	5½	7	23	48	53	18	17	19	20	822	785	1	594	549	81	134	1
142 ..	7½	5½	10	21	47	54	17	17	20	16	789	805	2	582	559	79	140	1
147 ..	7	5½	9½	18	44	54	16	17	21	20	826	825	1	620	569	77	150	1
144 ..	5	5½	7	9	36	53	19	16	17	20	813	775	1	588	544	66½	126	1
Group 5—																		
140 ..	7	4½	7	22	47	53	18	21	19	16	776	795	2	582	554	76½	138	2
138 ..	6	5½	9	24	50	54	19	19	20	16	789	805	1	615	559	80½	142	2
151 ..	4½	6	5	19	43	52	14	10	14	20	774	745	1	592	519	69½	114	1
148 ..	6	6½	9	15	41	54	15	16	21	19	823	825	1	626	569	71½	150	1
149 ..	6	6	9	27	52	53	18	17	19	20	820	795	1	598	554	87	136	1
Group 6—																		
146 ..	6	6	10½	18	44	54	19	19	20	20	814	805	1	632	559	80½	140	2
137 ..	8	4	6½	14	40	54	7	29	21	10	776	825	3	581	569	52½	150	3
139 ..	6½	5	8½	19	44	53	20	19	19	17	780	795	1	599	554	77	138	2

* A.M.—actual measurement; † S.M.—standard measurement; Pts.—points.

TABLE 4.

GROUP WEEKLY GAIN.

—	Week.																					At Week 10.	Total.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.		
Group 1—																									
No. in group ..	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	4	4	4	1	..	..	6	..
Food consumed (lb.)	74	120	139	169	187	180	168	175	170	146	185	179	208	238	261	278	282	246	231	171	46	..	..	1,528	3853
Weight gain (lb.) ..	9	47	40	67	45	65	15	23	63	25	42	20	65	86	49	65	63	22	38	20	15	..	..	399	884
F.C.R.	8·1	2·6	3·5	3·8	4·2	2·8	11·27	7·6	2·7	5·8	4·4	9·0	3·2	2·8	5·3	'4·3	4·5	11·2	6·1	8·6	3·1	..	..	3·80	4·35
Group 2—																									
No. in group ..	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	4	4	1	..	..	..	..
Food consumed (lb.)	83	115	130	167	176	178	171	165	165	159	171	185	203	213	202	276	276	265	238	165	45	..	..	1,509	3,748
Weight gain (lb.) ..	12	40	41	54	39	39	10	37	53	41	33	38	66	22	103	60	47	28	52	36	14	..	..	366	865
F.C.R.	6·9	2·9	3·2	3·1	4·5	4·6	17·1	4·5	3·1	3·9	5·2	4·9	3·1	9·7	2·0	4·6	5·9	9·5	4·6	4·6	3·2	..	..	4·11	4·33
Group 3—																									
No. in group ..	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	1	1	1	..	..
Food consumed (lb.)	84	130	139	163	173	174	160	184	169	132	165	171	198	248	259	288	286	270	254	175	41	43	36	1,508	3,942
Weight gain (lb.) ..	8	38	39	50	24	42	8	31	58	57	21	24	41	91	53	52	44	40	47	39	15	21	3	355	846
F.C.R.	10·6	3·4	3·6	3·3	7·2	4·1	20·0	5·9	2·9	2·3	7·9	7·1	4·8	2·7	4·9	5·3	6·5	6·8	5·4	4·5	2·7	2·0	12·0	4·25	4·65
Group 4—																									
No. in group ..	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	5	..
Food consumed (lb.)	64	93	104	113	128	130	122	134	134	141	156	161	181	194	324	306	256	275	243	271	245	169	152	1,480	4,096
Weight gain (lb.) ..	−2	39	35	32	41	27	21	44	45	22	46	31	17	53	29	43	27	16	33	10	36	69	5	350	719
F.C.R.	..	2·4	3·0	3·5	3·1	4·8	5·8	3·0	3·0	6·4	3·4	5·2	10·6	3·7	11·2	4·0	6·7	7·3	4·7	9·0	3·3	2·4	30·4	4·23	5·69
Group 5—																									
No. in group ..	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3	3	..	..
Food consumed (lb.)	61	83	100	120	123	132	123	130	136	125	146	168	184	201	205	209	222	235	201	202	156	148	128	1,459	3,338
Weight gain (lb.) ..	5	33	29	45	20	17	2	26	39	34	53	36	46	70	6	54	21	41	29	2	48	42	12	319	710
F.C.R.	13·2	2·5	3·4	2·7	6·2	7·7	61·5	5·0	3·5	3·7	2·8	4·7	4·0	3·0	34·2	3·9	10·6	5·7	6·9	10·1	3·3	3·5	10·1	4·57	4·70
Group 6—																									
No. in group ..	5	5	5	5	[5	5	5	5	5	5	5	5	4	4	4	3	3	3	3	3	1	..	..	..	..
Food consumed (lb.)	45	88	97	118	127	128	132	112	145	132	151	128	168	171	324	306	256	275	243	271	245	..	..	1,403	3,662
Weight gain (lb.) ..	−6	28	35	24	17	48	5	10	53	23	73	9	39	50	−1	23	14	17	24	16	16	..	..	319	517
F.C.R.	..	3·1	2·8	4·9	7·5	2·7	26·4	11·2	2·8	5·7	2·1	14·3	4·3	3·4	..	4·0	6·7	7·3	4·7	9·0	3·3	..	..	4·40	7·08

Discussion of Results.

Growth of Experimental Animals.—One of the more striking features of the experiment is the poor growth of the pigs on what appears an adequate ration. For any stage of growth sufficient crude protein, energy and calcium are available. The rations appeared palatable and were consumed in adequate quantity for satisfactory weight gains to be made. The molasses used was sugar cane molasses and because of its low moisture content was very thick. On analysis it contained 28 per cent. sucrose and 30.7 per cent. other carbohydrates. The meat-and-bone meal was a local product prepared by dry-rendering meat scraps and had a low biological value for a foodstuff rich in animal protein. The lucerne hay was of fair quality and the maizemeal was well-ground high quality maize of the previous season.

These rations are not rich in B vitamins and an improved growth rate might result by allowing pigs on such diets to graze young pasture.

Inspection of Table 2 shows that a large proportion of the rations was made up of lucerne hay. As a result the weight/volume ratio of the rations is wide and this may have influenced growth rate. Although the pigs consumed the ration in sufficient quantity, the large volume of food may have had an adverse effect on growth rate. On analysis, the diet contained only 6 per cent. fibre up to 100 lb. and 9 per cent. thereafter; these fibre levels are considered reasonable for growing pigs, but the physical effect of the volume of food consumed may have lowered the net energy of the ration.

From a previous molasses feeding trial it was found that 6 and 9 per cent. fibre were required to stop the scouring produced by molasses. To provide these amounts in the trial now reported, the feeding of such high levels of lucerne hay was required that a review of the conclusions from the previous experiment may be necessary.

The weekly food consumption of each group increased with time but the weekly weight gain was variable and there was no constant relationship between weight gain and food consumption. In both phases of the trial, the low-high molasses group showed the most favourable food conversion ratio. These groups, compared with the high-low and the high-high groups, received a diet with a narrower weight volume ratio up to 100 lb.

In general, the quantity of food consumed by the groups bears no relation to the volume of the ration of the level of molasses fed.

Appraisal of Carcases.—The results of body length as shown in Table 4 may be summarised as: 11 pigs exceeded the standard; 4 were 10 mm. short of the standard; 7 were between 10 and 20 mm. short; 6 were between 21 and 40 mm. short; and 3 were 41 to 50 mm. short. Twelve pigs were under standard for backfat thickness, 4 were standard, 7 exceeded the standard by 2 mm., 6 were 2–5 mm. in excess; and 2 had a backfat thickness greater than 5 mm. Only one pig had an eye muscle exceeding the standard. Every pig exceeded the standard leg length.

Characteristics of animals on a poor nutritional plane are excessive leg length, small eye muscle and incomplete subcutaneous covering. The results show that the experimental pigs lived on a low nutritional plane.

Gradings.—The majority of pigs which graded first for the local requirements came from groups 4 and 5. These pigs were the slowest growing pigs in the trial and had a backfat thickness less than the standard.

TECHNIQUE OF WEANING AT FOUR WEEKS.

These studies were carried out at the Biloela Regional Experiment Station.

The piglets were housed in wooden sheds with concrete floors and allowed continuous access to pasture. Dry meal was kept before them continuously and fresh water made available in shallow troughs. No efforts were required to teach the piglets to partake of food, as creep feed was made available to them during their suckling period. Males were castrated at an early age to allow the wounds to heal before the trial commenced.

The litters subject to the treatment were randomly selected. Eighty-seven piglets have been studied.

The results are summarised in Table 5.

TABLE 5.

RESULTS OF WEANING TRIAL.

Trial Number.	Number of Piglets in Trials.	Average Weight at 4 Weeks.	Average Weight at 8 Weeks.	Food Conversion Ratio.
		Lb.	Lb.	
1 ..	9	18·96	33·59	2·45
2 ..	12	15·4	29·8	1·91
3 ..	19	15·0	29·8	2·21
4 ..	20	13·45	22·56	2·77
5 ..	18	15·0	32·0	1·8
6 ..	9	18·8	32·1	2·1

Average weight 87 piglets 4 weeks .. 15.2 lb.
Average weight 87 piglets 8 weeks .. 28.5 lb.
No deaths occurred during the trial period.

Discussion of Results.

Weight at Four Weeks.—Only 7 piglets weighed under 10 lb. at 4 weeks. Their growth is shown as follows:—

Number.	Weight at 4 Weeks.	Weight at 8 Weeks.	Gain.
	Lb.	Lb.	Lb.
1	8·9	15·8	6·9
2	3·3	3·8	0·5
3	5·1	6·5	1·4
4	8·8	16·4	7·6
5	9·0	18·4	9·4
6	8·1	21·4	13·3
7	5·0	12·0	7·0

Four piglets weighed more than 20 lb. at 4 weeks and 14 weighed over 19 lb. Their growth summary is—

Number.	Weight at 4 Weeks.	Weight at 8 Weeks.	Gain.
	Lb.	Lb.	Lb.
1	20·1	32·5	12·4
2	20·0	31·5	11·5
3	21·3	37·1	15·8
4	22·6	35·1	12·5
5	19·4	32·3	12·9
6	19·3	36·1	17·1
7	19·0	28·7	9·7
8	19·2	35·0	15·8
9	19·6	35·6	16·0
10	19·0	36·7	17·7
11	19·3	32·8	13·5
12	19·2	32·1	12·9
13	19·2	31·2	12·0
14	19·6	35·5	15·9

The average gain was 14.9 lb., whereas for the upper group it was 6.6 lb. for the four weeks.

Gain over Four Weeks.—The growth records of pigs gaining less than 10 lb. is given below—

Number.	Weight at 4 Weeks.	Weight at 8 Weeks.	Gain.
	Lb.	Lb.	Lb.
1	19·0	28·7	9·7
2	11·6	20·0	8·4
3	10·0	19·9	9·9
4	12·4	19·9	7·5
5	8·9	15·8	6·9
6	11·2	20·4	9·2
7	18·9	28·1	9·2
8	16·8	25·5	8·7
9	7·6	14·0	6·7
10	14·7	22·1	7·4
11	3·3	3·8	0·5
12	5·1	6·5	1·4
13	8·8	16·4	7·6
14	9·0	18·4	9·4
15	12·5	20·5	8·0
16	15·7	22·3	6·6
17	15·5	21·6	6·1
18	16·5	26·3	9·8
19	15·2	25·0	9·8
20	15·0	12·0	7·0
21	18·1	28·0	9·9
22	17·8	27·4	9·6

Seven pigs grew more than 20 lb. and 14 pigs more than 18 lb. during the period.

Number.	Weight at 4 Weeks.	Weight at 8 Weeks.	Gain.
	Lb.	Lb.	Lb.
1	17·7	40·2	22·5
2	16·6	36·6	20·6
3	17·8	40·5	22·7
4	17·1	38·4	21·3
5	16·0	39·0	23·0
6	12·3	33·1	20·8
7	15·6	37·0	21·4
8	15·8	34·7	18·9
9	15·7	34·7	19·0
10	16·0	34·0	18·0
11	15·4	33·8	18·4
12	18·4	37·1	18·7
13	13·6	32·4	18·8
14	11·9	30·6	18·7

The average weight at four weeks of the pigs gaining more than 18 lb. was 15.7 lb.

Distribution of Weight at Eight Weeks.—

Range of Wt. Lb.	No. of Pigs.
40	1
38–40	2
36–38	7
34–36	12
32–34	9
30–32	10
28–30	9
26–28	10
24–26	10
22–24	2
20–22	5
18–20	3
16–18	2
14–16	2
12–14	1
8–10	..
6– 8	1
4– 6	..
2– 4	1
10–12	..

Of the 87 pigs, 61 (70 per cent.) weighed between 24 and 36 lb. In the weight range 24–36 lb., the mean was around 31 lb., whereas the average for the 87 pigs was 28.5 lb. Almost 20 per cent. of the pigs weighed less than 24 lb.

The 4-weeks weight dispersion of pigs growing less than 10 lb. in the period is from 3.3 lb. to 19.0 lb., with a mean of 12.4 lb., which is below the mean of the 87 pigs. The group of pigs which weighed under 10 lb. at four weeks grew only 6.6 lb. on the average.

A review of the results shows that the lighter pigs failed to make the same weight gains as heavier pigs. Observations of piglet behaviour show that the heavier pig eats dry meal at an earlier age than the lighter pig and this is reflected in the growth rate.

The piglets which grew more than 18 lb. in the period had a mean weight at four weeks of 15.9 lb. The average weight of the 87 piglets was 15.2 lb. Although the average gain for all the piglets was 13.3 lb., the group that made the most gain are not significantly heavier than the mean weight of all the pigs. The results from the work so far do not show that the greatest gains come from the heaviest pigs. However, sufficient numbers of pigs have not been studied to give statistical significance to any observation.

The weights recorded in these experiments are most interesting. At four weeks, the average weight is 15.21 lb. and at 8 weeks it is 28.5 lb. Thus, growth during the first four weeks is about the same as during the second four weeks. The growth, measured as weight gain, from four to eight weeks should be greater than that of the first four weeks.

Nutrition is the main influence on growth at this period. Thus, the rations for use in 4-weeks weaning need to be reconsidered. The energy of the ration is quite high, but apparently not sufficient of it is eaten. Future experiments will utilise piglet lures, such as peanut oil, sugar, and whey powder, as well as antibiotics.

The food conversion ratio is in the same range as is found by other workers. Thus, if more food was consumed, a greater weight gain should result.

Summarising, it may be said:

(1) Piglets weighing under 13 lb. at four weeks usually fail to make satisfactory weight gains when fed dry meal.

(2) The optimum weight range at four weeks for satisfactory growth is 15.5 lb. to 16.5 lb.

(3) The average weight of the piglets at eight weeks is 28.5 lb. Heavier weights are desired.

(4) The food conversion ratio is less than 2.5 : 1. If it is desired to force-feed piglets this would be the most profitable time to do so.

DISEASE.

No widespread outbreak of acute disease or new clinical entity was reported during the year. The necessary measures to prevent the introduction of exotic disease were policed in part by members of the Section. The most likely source of any foreign introduction is considered to be the garbage from overseas airliners.

One hundred farmers are now participating in the Brucellosis Testing Scheme which is organised by the Section in conjunction with the Veterinary Services Branch. This represents an increase of nine during the year.

GENERAL.

During the past 12 months all Commonwealth Extension Services Grant projects were maintained, but owing very largely to adverse seasonal conditions much of the work based on grazing demonstrations was disappointing.

The circular farrowing pen continues to attract the attention of farmers, with the result that a number of pens have been constructed in the Moreton area and on the Darling Downs. In the Burnett area the demonstration pens were not constructed until late in the year, but considerable interest has been evinced there also. As predicted, in practically all cases where sows have farrowed in a circular type pen, considerable reduction in losses from overlaying and accidents, resulting in larger litters being reared, has been secured.

Good progress was maintained with respect to the Pig Testing Station at Rocklea. The main buildings, installation of the gristing and air-conditioning plants and the design, construction and purchase of the necessary equipment have been completed, leaving only the painting and several small items to be finished.

Interest in the Testing Station appears to be growing and several producers have already intimated their intention to make application to have their herds tested. When in operation the Station will afford stud breeders the opportunity of having their stock tested for such factors as weight for age at slaughter, food conversion efficiency and carcase quality. Such information will enable producers and intending purchasers to eliminate most of the guesswork from breeding programmes and select the best blood lines with certainty.

The design and appointments of the Station have been very favourably commented upon by prominent overseas and interstate visitors.

POULTRY SECTION.

Most commerical poultry raisers in Queensland felt the impact on profitability of a 20 per cent. increase in feed costs, resulting from drought conditions prevailing in cereal growing areas. Those in south-eastern Queensland, where the annual net return on eggs is influenced greatly by export values obtained for surplus production marketed overseas, were faced with serious economic difficulties.

The results of high feed costs and low returns in this area of the State have been a reduction in the number of people engaged in poultry farming and a decrease in the volume of eggs produced. In general, it may be said that conditions were such that only established poultry farmers with capital reserves sufficient to meet the economic losses from July to November of the year under review were able to carry on. As a consequence of the reduction in laying flocks and the fewer replacement chickens purchased, the supply of eggs fell, thus bringing about eventual and substantial price rises. For those farmers who remained in the industry, the average net return for eggs supplied to Marketing Boards during the year was some 10 per cent. higher than for 1956-57.

Not only is there now greater emphasis on autumn and winter production, but the view is being accepted that poultry farming is a business enterprise requiring substantial capital investment if success is to be attained. For example, it is interesting to record that one farmer who has in excess of 10,000 birds considers that mechanical feeders may help in reducing the hired labour requirement on his farm. One of his 1,000-bird intensive sheds has been equipped with a mechanical feeder imported from the United States of America. Overhead monorail systems to provide ease of feeding and egg collection are being considered by a number of efficient and progressive farmers.

In Central Queensland, despite drought conditions and higher feeding costs, production is expected to be some 10 per cent. higher than in the previous year. It has been reported by the poultry officer stationed in this area that more pullets, with their higher rate of lay, and fewer second-year hens are being kept as sideline units on farms. Such a trend must result in a higher annual rate of lay and provide more eggs in autumn and winter. In this regard it is of interest to note that from January to March 1958, recorded production at the Central Queensland Egg Marketing Board at Rockhampton was 21 per cent. higher than for the same period in 1957, although there has been no significant increase in flock numbers or size.

The establishment of a poultry abattoir in Rockhampton has provided a convenient outlet for hens, and has brought more stability to poultry production in Central Queensland.

Production in North Queensland remains at or near the level of 1956-57. Townsville, without an adjacent rich hinterland, derives its main supply of eggs from 14 commercial farmers, two of whom have over 5,000 head of poultry, These two farms are amongst the most efficient in the State. On the other hand, Cairns derives its eggs from three large poultry farms within a radius of five miles of the city, from sideline farms, and from a few commercial farms on the Atherton Tableland.

POULTRY IMPROVEMENT PLAN.

Nine poultry breeders are co-operating with the Department in the Queensland Poultry Improvement Plan. Seven of them are using genetically sound breeding schemes based on the sire-family system, in which the half-sister progeny test is used to indicate superior families. Two breeders are using laying cages, and thus have individual records. They are working on a "full-sister" scheme, which is more involved than a "half-sister" scheme, for it requires that chickens derived from the various matings be pedigreed to both the dam and the sire. It is of interest to record that these breeders are using artificial insemination to produce progeny from selected hens and sires. The Poultry Section has been active in assisting and guiding farmers with the compilation of their records. Three additional breeders have signified their willingness to commence breeding programmes in co-operation with the Department during the coming year.

RANDOM SAMPLE TESTING.

Random sample testing of breeding flocks in conjunction with the Queensland Poultry Improvement Plan commenced in August 1957, when samples of 180 hatching eggs per farm were taken and incubated at the Poultry Section of the Animal Husbandry Research Farm at Rocklea.

An average hatchability of 75 per cent. was obtained for all eggs set. There was, however, a considerable variation in breeders' samples, the range being 60–82 per cent. Eggs were candled to check on fertility on the 7th and 18th days of incubation. At seven days, all "clears" (eggs which when held to a bright light do not show a shadow due to embryonic development) were broken out and examined for signs of embryonic development. It was found that a number of eggs which would normally be classed as "clears" and therefore infertile, had in fact been fertile, the embryoes dying within the first few days after setting in the incubator.

The day-old chicks were sexed by a qualified chick sexer, and the pullets accommodated in five rooms of the brooder house equipped with hover brooders. The losses from day-old up to the 10th week were 6.4 per cent., and from the 10th to the 18th week they were just over 1 per cent. These percentages are well in line with those of losses on good commercial farms.

At 18 weeks of age, the pullets were sorted into their respective groups according to the flock from which they were derived. Each breeder's flock was represented by two samples, each of 20 pullets, accommodated in different rows of the laying sheds.

The average age to maturity (first eggs) for all groups (both Australorp and White Leghorn) was 152.8 days, or just under 22 weeks. Within four weeks of laying of first eggs, one group of Australorps attained a production rate of 50 per cent.—i.e., the number of eggs laid per day was equivalent to half of the birds laying at that time. The production phase of the test had been running for 20 weeks up to the end of June. Interim results show that the hen-housed average of the Australorp groups is some 9.1 eggs higher than that of the White Leghorn samples.

The eggs from each group are also being graded individually by the Egg Marketing Board. The grading results are providing valuable information regarding egg size, shell quality and the occurrence of internal blemishes such as blood spots. Wide differences are being found between various breeders' groups with regard to size and eggshell quality.

FEEDING AND MANAGEMENT DEMONSTRATIONS.

During the year, feed troughs fitted with wire grills were purchased from Commonwealth Extension Services Grant, and sets of troughs were made available to six co-operating farmers. These demonstrations are designed to show how food wastage can be reduced by the use of well-constructed food troughs. In general, sufficient troughs were made available to each co-operator to provide adequate feeding room for 300 birds. All six demonstrations are still in progress.

Demonstrations on the value of high-level feeding of oxytetracycline ("Terramycin") in flocks where chronic respiratory disease had been diagnosed by veterinary examination were concluded during the year. In cases where chronic respiratory disease was the only member of the respiratory complex present, very good responses were noted. However, further examination of other flocks which showed little response revealed the presence of other respiratory diseases such as coryza and infectious laryngotracheitis, which do not respond to the tetracycline drugs.

EXTENSION WORK.

Over 4,000 visits were paid to farms for the purpose of extension work. Officers also gave 624 method demonstrations. Demonstrations of fowl pox vaccination and culling for egg production were those more frequently sought. Other mass media used in the Section's extension programme included radio broadcasts (12), talks to farmers' associations (38), and the preparation of new bulletins (29). Two farm tours were also organised during the year.

EXPERIMENTAL WORK.

Free-Choice Mash-Grain Feeding.

This experiment, designed to find whether pullets on a protein level higher than 17.5 per cent. would eat more grain in relation to mash, and so cheapen feeding costs, was carried out at Kairi Regional Experiment Station as a repetition of a trial conducted in 1954-55.

As in the previous trial, three laying mashes were used with total crude protein contents of 17.5, 22.5, and 27.5 per cent. These mashes, along with whole wheat, were each fed, free choice, to a group of 90 pullets divided into six sub-groups of 15. Mash and wheat were placed in two similar troughs in each of the 18 pens.

This trial ended after a period of 44 weeks, as the accommodation was required to house pullets reared at Kairi during 1957.

The results obtained are set out in Table 1.

TABLE 1.

RESULTS OF FREE-CHOICE FEEDING EXPERIMENT.

Data.	17·5% Protein Mash + Grain.	22·5% Protein Mash + Grain.	27·5% Protein Mash + Grain.
Number penned at beginning of test	90	90	90
Deaths	9	6	6
Hen-housed average production (44 weeks)	139·1	127·0	138·5
Pounds of feed/dozen eggs	7·8	9·3	8·5
Grain as percentage of total food intake	49	58·1	63·3
Average price for wheat per lb. (1957) in pence	4·44	4·44	4·44
Average price for mash per lb. (1957) in pence	4·28	4·56	4·95
Total cost of food eaten by group	£148 0s. 2d.	£165 15s. 11d.	£171 7s. 5d.
Cost per lb. per group in pence	4·35	4·48	4·63
Cost to produce 1 doz. eggs in pence	33·93	41·66	39·35
Calculated percentage protein intake	14·3	15·8	17·1

The feeding costs were considerably higher than in the 1954-55 trial (4.35d. compared with 3.82d.). This was due in part to the increased prices for wheat and some other ingredients during 1957. As in the previous test, the rations with the lowest and the highest protein levels gave similar levels of production, and exceeded that of the medium protein level of 22.5 per cent.

It would appear from this trial that there is a substantial increase (14.3 per cent.) in the quantity of grain in relation to mash eaten as the protein content increases. Such was not the case in the earlier test, where birds on the highest protein mash ate only 5.6 per cent. more grain than those on the lowest protein mash.

The range in protein intake from 14.3 to 17.1 per cent. did not appear to have any adverse effect on production. It could well be that some economy in the use of expensive animal protein, which is often in short supply, could be practised without any effect on production.

Fibre Level and Chick Growth.

The modern trend in poultry nutrition is to feed high-energy rations. These high-energy rations have a lower level of fibre and a higher calorific value than those used in the past. This is achieved by increasing the amount of crushed grains in the ration and reducing that of the fibrous feeds such as bran and pollard. In addition, the protein level may be slightly raised, and the quality of the protein used closely examined.

The opportunity was taken at the Kairi Station to investigate the influence of rations differing in fibre content on chick growth, with other observations on food consumption and feathering.

In this experiment, five groups, each of 90 day-old pullets, were brooded in five separate brooder pens. Two groups were fed the low-fibre ration calculated to contain 3.2 per cent. fibre. Two groups were fed a ration containing a medium fibre level of 5.2 per cent., and one group was fed a relatively high fibre ration containing 7.2 per cent. fibre. At four weeks of age, the chickens were removed from the brooder house and accommodated by group in each of five pens. The same feeding schedule continued until the end of the experimental period, viz. 12 weeks.

Table 2 sets out the rations used in this experiment, and the experimental results.

TABLE 2.

EXPERIMENTAL RATIONS IN FIBRE LEVEL TRIAL.

Ingredient.	Ration 1 Low Fibre.	Ration 2 Medium Fibre.	Ration 3 High Fibre.
	Per cent.	Per cent.	Per cent.
CHICK STARTER MASHES.			
Maizemeal	40	40	22
Wheatmeal	35	12	..
Bran	..	15	30
Pollard	..	10	25
Meatmeal	14	12	9
Buttermilk powder	5	5	5
Livermeal	3·5	3·5	3·5
Lucerne Meal	2	4	5
Salt premix	·5	·5	·5
SUPPLEMENTS.			
Manganese sulphate (grams)	8	8	8
Synthetic riboflavin (milligrams)	160	160	160
Stabilised vitamin A and D3 (oz.)	·5	·5	·5
EXPERIMENTAL RESULTS.			
Number of chickens at start	180	180	90
Deaths	5*	13†	1
Weight at day-old (oz.)	1·28	1·29	1·3
Weight at 8 weeks (oz.)	21·6	25·04	26·4
Weight at 12 weeks (oz.)	38·7	43·2	44·3
Food/Gain Ratio (12 weeks)	4·27	4·49	4·83

* 4 due to cannibalism.
† 3 due to cannibalism.

It would appear that under the conditions of this experiment chickens reared on either the medium-or high-fibre rations gave better growth responses than those reared on low-fibre rations. However, when the value of the rations is considered from the point of view of feed efficiency as indicated by the food/gain ratio, the low-fibre rations would prove more economical. Losses for the 12-weeks experimental period were only 4 per cent. Losses due to cannibalism were not severe, and occurred in the low- and medium-fibre groups.

The officer in charge of this work at Kairi Regional Experiment Station reported that water consumption of chickens on the high-fibre mash was almost double that of the low-fibre fed chickens.

Fibre Levels and Egg Production.

Of the 444 birds remaining from the fibre level trial with chickens, 360 pullets were selected at 18 weeks of age to continue with the next stage of the trial, viz., the influence of fibre levels on egg production.

These pullets were divided into three groups, each of 120, and each group was further subdivided into six pens of 20 pullets. Each of three rations was fed to one of the three groups. The laying ration had a fibre level similar to those used in the chicken experimental mashes, and the formulations for the rations were rather similar to those used previously, with the exception that the total crude protein content was lowered from an average of 19.4 to approximately 15.5 per cent. To date, the group of birds on the low-fibre ration has the highest hen-housed production and the lowest feed consumption. This trial has a further 32 weeks to run.

Free-Choice Grain and Meal.

Free-choice whole grain and meat-and-bone meal feeding of layers is used to a limited extent by some poultry farmers in Queensland, who claim good production and reduced feeding costs. Accordingly, 450 day-old chickens were reared at Kairi Regional Experiment Station and divided into nine groups, each of 45 birds. Three of these groups are being fed whole sorghum and meat-and-bone meal. Three groups are being fed whole maize and meat-and-bone meal, and a further three groups are being fed an all-mash ration, which contains crushed maize and sorghum in addition to meat-and-bone meal. The commencement of this trial was delayed owing to an outbreak of intestinal coccidiosis, followed by fowl pox, during the period 18–20 weeks of age.

Quality of Meat-and-Bone Meals.

During 1956, farmers in a North Queensland area reported poor growth, gizzard erosion and a relatively high death rate for no apparent cause. The poor growth and the occurrence of gizzard erosion suggested a dietary fault, particularly as the farmers in the locality were using the same meat-and-bone meal. A bag of this meat by-product was obtained and forwarded to the Poultry Section of the Rocklea Animal Husbandry Research Farm.

A simple exploratory trial was carried out at Rocklea with four groups each of 50 chickens. Two of these groups were fed a ration with Q.M.I.B. meat-and-bone meal as the sole source of animal protein and two groups fed a ration very similar in formulation but containing the test meat-and-bone meal. The test sample was some 5 per cent. lower in protein than the Q.M.I.B. sample, but had higher levels of calcium and phosphorus. The rations were so adjusted as to have comparable protein, fibre, calcium and phosphorus levels.

One of the Q.M.I.B., and one of the test meat-and-bone meal groups were used for gizzard erosion studies, 10 birds from each of these groups being sacrificed at fortnightly intervals. The remaining two groups were used for comparing weight gains and feed consumption.

As gizzard erosion was noted in both the Q.M.I.B. and test groups, no conclusion as to the specific effect of test meat-and-bone meal on the gizzard lining could be drawn. On the other hand, the weight differences between groups fed the two brands of meat-and-bone meal were very significant, as also was feed consumption. The results obtained are shown in Table 3.

TABLE 3.

Results of Meat-and-Bone Comparison Trial.

	Q.M.I.B. Group.	Test Group.
	oz.	oz.
Weight per chicken at day-old ..	1.38	1.38
Weight per chicken at 4 weeks ..	8.59	4.56
Weight per chicken at 8 weeks ..	23.76	12.23
Total food consumption per chicken	77.80	44.10

Weight and consumption of food per chicken for the Q.M.I.B. group were almost twice those for the test group at eight weeks of age.

The results raised the question whether there is some factor or combination of factors in the test meat-and-bone meal which depresses growth and therefore food consumption, or whether the poor growth is the direct result of a lowered food intake because of unpalatability of the test meat-and-bone meal. Deaths in groups fed either ration were negligible.

Following the very significant results shown in Table 3, the two likely causes for the poor growth on the test meat-and-bone meal were further investigated. In one experiment, additional vitamin E was added. Chickens fed the test meat-and-bone meal were given extra vitamin E by individually dosing each one with two 10 mg. capsules twice a week until they were 10 weeks of age. This did not result in any improvement in the rate of growth. In the second trial, the Biochemical Branch extracted the fat from samples of both meat-and-bone meals, and then re-incorporated the fat from the test meal with the fat-free-extracted sample of Q.M.I.B. meat-and-bone meal, and *vice versa*. The results of this short-term test at four weeks of age showed that the fatty portion of the test meat-and-bone meal was not responsible for the poor growth. The addition of fat from Q.M.I.B. meat-and-bone meal to the defatted test meat-and-bone meal did not improve growth or food consumption.

It is suggested that poor processing probably due to over-cooking had caused some denaturation of the protein of the test meal, thereby lowering its digestibility.

Bloodmeal in Chick Starter Mashes.

Bloodmeal was fed to two groups of chickens as the sole source of animal protein in a normal type of chick starter mash. Two identical rations containing Q.M.I.B. meat-and-bone meal were used as a control. One of the trial groups and one of the experimental groups were individually dosed with vitamin E capsules twice a week for 10 weeks. At 10 weeks of age, the bloodmeal groups, irrespective of supplementation with vitamin E were less than half the weight of the control groups. Mortality in the bloodmeal group supplemented with vitamin E was 53.3 per cent., and in the other bloodmeal group 40.4 per cent. Death rates in the control birds averaged about 9 per cent. The feathering of the bloodmeal groups was very poor and very ragged. The results indicate that bloodmeal is totally unsuitable as a source of protein in chick starter mashes.

Effect of Early Debeaking.

This experiment, to find whether debeaking and in particular the age at which young chickens are debeaked have any subsequent effect on growth and food utilisation, was commenced early in June, 1957, and concluded 20 weeks later.

Four hundred Australorp pullets were individually wing-banded and weighed at day-old and further individual weighings were carried out at 4, 8, 12, 16, and 20 weeks. Observations on food consumption for the various groups were made. The day-old chickens were divided into eight experimental groups each of 50 chickens. Two groups were not debeaked and served as controls; two groups were debeaked at day-old; a further two groups were debeaked at seven days; and the remaining two groups were debeaked at 14 days. All groups were fed on the same chick starter mash, followed by an all-mash growing ration.

The results obtained are set out in Table 4.

TABLE 4.

Effect of Debeaking at Various Ages on Growth and Food Utilisation.

Experimental Group.	Average Weight per Bird (oz.).				Feed/Gain Ratio.		Percentage Mortality.
	Day-old.	8 Weeks.	12 Weeks.	20 Weeks.	12 Weeks.	20 Weeks.	Day-old to 20 Weeks.
Control (not debeaked)	1·33	22·9	40·4	74·3	4·31	7·1	13
Debeaked at day-old	1·28	20·2	36·1	66·7	4·28	6·8	24
Debeaked at 7 days	1·31	22·0	41·2	72·4	3·76	7·7	13
Debeaked at 14 days	1·34	22·5	40·0	70·1	4·15	7·8	10

Up to the age of 12 weeks debeaking gave a better food utilisation as indicated by the feed/gain ratios. The practice of debeaking at day-old appeared to have given the groups so treated an early setback as suggested by the weight comparisons in Table 4. This group was still the lightest group at 20 weeks of age, but it is noted that its efficiency of food utilisation is the best. Against the economy of the group must be debited the heavier losses which appear to be related to the age at which this group was debeaked. It is of interest to note also that when runts were culled from the groups at 12 weeks of age the number of culls from the group under discussion was almost double that from other groups.

The results would indicate that up to 12 weeks of age debeaking is of value in reducing food wastage, and that if debeaking is to be carried out, it should be done at ages other than day-old.

Artificial Lighting Experiments.

With Second-Year Birds.—This trial, which was reported in the 1956-57 Report, was concluded in August 1957. The hens under lights produced over 50 per cent. more eggs than the controls—the final hen-housed averages being 47.6 eggs per bird (under lights) and 30.3 eggs per bird (without lights) for the period March-August. However, eggshell quality in the lit group was poor and it is considered that much of the advantage gained by increased production would have been offset by breakages during packing, and grading operations. The lit group consumed less than 6 per cent. more feed than the control.

With Early-Hatched Pullets.—The Australorp pullets hatched in June and used in the debeaking trial until 20 weeks of age were divided into eight groups of approximately 40 per group. Four of these are housed under lights in the front row, and the other four are in the rear row of pens. Lighting commenced on March 10, with lights coming on automatically at 4.30 a.m., the lighting time being moved back half-an-hour per month.

This experiment will not conclude until September. Results to June 30 set the hen-housed production of the two groups as 127.6 eggs (under lights) and 123.2 eggs (control). When egg production is considered on a survivor basis, the average production of the group under lights is 143.9 eggs per bird (under lights) and 128.1 eggs per bird (control).

DISEASE SITUATION.

Intestinal coccidiosis and the avain leucosis complex were the most common diseases reported throughout the State by officers of the Poultry Section. Fowl pox was more prevalent during the year under review than in former years. Outbreaks were reported in southern Queensland as late as May. This higher incidence is due, no doubt, directly to the presence of mosquitoes, often in plague proportions, and indirectly to the hot, humid conditions which prevailed until the end of autumn.

The respiratory complex, particularly coryza and chronic respiratory disease (C.R.D.), was often reported during the year. As with fowl pox, the incidence was highest during the warmer months of the year. The most serious aspect of C.R.D. is that the causal organism of this disease is transmitted from hatcheries with infected flocks to clean farms. It has been demonstrated in the United States of America that the regular treatment of a breeding flock with streptomycin sulphate injected intramuscularly gives a good control of transmission of the disease *via* the hatching egg. It is planned to provide two hatcheries with streptomycin sulphate purchased from C.E.S.G. funds to demonstrate control by this method.

It is of interest to record also the fact that vitamin A deficiency was more prevalent than in other years. Cases were confined mainly to small side-line flocks on farms in country districts and were related to drought conditions.

Cannibalism in its various forms, such as feather pulling and eating, toe and vent picking and mutilation of carcases, was quite common. There seems good ground to suggest the more intensive methods of poultry farming and the wider use of low-fibre rations as contributory causes.

PULLORUM TESTING.

Table 5 sets out the pullorum testing results for the year. The average percentage reaction for the State is at the low figure of 0.7. It will be noted that the number of clean farms (those which gave no reaction at the annual test) is less than reported in 1956-57. This provides a very good reason why the annual pullorum testing programme must be continued. It will be seen also that the total numbers of flocks and of birds tested are lower, due to a smaller demand for replacement stock by the poultry industry.

TABLE 5.

PULLORUM-TESTING STATISTICS, 1955–56 TO 1957–58.

—	1955–56.	1956–57.	1957–58.
Total number of fowls tested	227,773	226,571	220,300
Number tested for registered stock suppliers	223,302	224,689	215,666
Number of registered stock suppliers' flocks tested	137	139	124
Number of flocks with no reaction at test	57	84	68
Percentage reaction for State	·28	·15	·07

STICKFAST FLEA.

Further outbreaks of stickfast flea were reported at Cairns, Irvinebank and Charters Towers in North Queensland; at Baralaba in Central Queensland; and at Urangan and Warwick in the southern portion of the State. The outbreak at Cairns was confined to a few household properties, and enquiries elicited the information that poultry had been brought from Irvinebank to one of the Cairns properties. Investigations at Irvinebank revealed the stickfast flea to be well established there.

The outbreak at Charters Towers, Urangan and Warwick have been confined to a few household flocks. In all cases treatment with DDT was carried out and advice given on subsequent control measures. The Baralaba outbreak was more widespread. A survey showed 38 properties in the township to be moderately to heavily infested with the flea. The poultry officer at Rockhampton and members of the Veterinary Services Branch conjointly carried out treatment on all infested premises. The thoroughness of this survey and subsequent treatment have reduced the stickfast flea population to a low figure.

POULTRY STOCK SUPPLIERS.

During the year 14 stock suppliers cancelled their registrations for the business of hatching chickens for sale; eight cancelled for the business of supplying fowl eggs for hatching; and three dealers did not renew their registrations. New registrations were as follows:—eight for the business of hatching chickens for sale; eight for supplying fowl eggs for hatching; and 11 as poultry dealers. The number now registered as stock suppliers is 193.

PRODUCTION OF DAY-OLD CHICKENS.

The number of chickens sexed in 1957 was 2,959,496, which was 9 per cent. less than in the previous year. It was expected that the number of chickens sexed would be much less than this figure, because of the recorded decline in production. However, Queensland chickens are much in demand in New South Wales and this would account in no small way for the relatively low decline in hatchings.

POULTRY MEAT PRODUCTION.

Table 6 sets out the total number of poultry slaughtered in the Brisbane area. It will be seen that the total number of birds processed was less than in 1956-57.

TABLE 6.

POULTRY SLAUGHTERINGS AT ABATTOIRS IN BRISBANE AREA, 1953-54 TO 1957-58.

Years.	Cockerels (Chickens).	Hens (Broilers).	Total Slaughtered (including ducks, turkeys, etc).
1953–54 ..	240,049	311,444	604,725
1954–55 ..	137,118	346,417	512,438
1955–56 ..	316,991	381,561	734,952
1956–57 ..	348,922	400,105	779,090
1957–58 ..	362,713	377,962	762,060

The production of broiler-type chickens (young birds averaging 3-4 lb. liveweight) is increasing. No longer is table poultry production a side-line to egg production. Many of these chickens originate from a few large table-bird plants around Brisbane. It is of interest to record that some of the table poultry producers also have their own abattoirs and are paying close attention to the presentation of their product by using plastic vacuum extracted wraps.

Prices for chicken meat held steadily at 2s. 6d. per lb. liveweight, while hen meat fluctuated from 1s. per lb. to 1s. 8d. per lb., depending on the supply.

POULTRY ADVISORY BOARD.

This Board met on three occasions. The business dealt with included control over registration of stock suppliers and the grading and marking of eggs, the programme of experimental work to be conducted by the Poultry Section, random sample test rules, and the financial estimates of the Poultry Section.

BIOCHEMICAL BRANCH.

Dr. J. M. Harvey, Biochemist.

The year under review has seen further development of this relatively new Branch. This development has been made possible by the employment of a technician and by the appointment of two science graduates, one to the Biochemistry Section, and one to the Toxicology Section. The immediate result of this increase in staff has been an expansion in the diagnostic service and the initiation of new investigational projects.

The diagnostic service is maintained in collaboration with other Branches of the Division of Animal Industry. This service has three distinct functions. By biochemical analyses it provides exact data where nutritional disorders in livestock are suspected. By toxicological examination it supplies confirmation where extraneous poisoning is suggested. By chemical analysis of fluids from dipping vats it ensures economic and effective use of tickicides for the control of external parasites of livestock.

The Branch has initiated or collaborated in a number of investigational projects related to the livestock industry in Queensland. It is obvious that there is a close inter-relationship of animals, plants and soils. It is equally obvious that this necessitates a close liaison between all scientists engaged on rural problems and, wherever possible, a "team" approach to such problems. For these reasons the Biochemical Branch works in collaboration with other Branches both within the Division of Animal Industry and in the Division of Plant Industry.

Investigations with which this Branch is associated are:

(1) Studies on copper metabolism in ruminants: These include evaluation of different methods of copper supplementation, measurement of response from copper supplementation, examination of availability and factors which affect the availability of copper from pasture to the grazing animal, and investigations on the effect of pregnancy on the requirement of the ruminant for copper.

(2) Studies on phosphate metabolism in ruminants: These include survey data on the incidence of phosphate deficiency in cattle in Queensland, evaluation of different methods of supplementation, and the measurement of response to supplementation.

(3) Vitamin studies: These include an investigation on the effects of vitamin A deficiency in the laying fowl, pilot trials on the vitamin E requirement of chickens, and survey data on the vitamin A status in dairy cattle in Queensland.

(4) Studies on conserved fodder: These include digestibility data on pasture, hay and silage and an evaluation of the efficacy of additives used in silage making.

(5) Studies on chlorinated hydrocarbons: These include an evaluation of the chemical and physical characteristics and the biological efficiency of certain tickicides used in dipping vats in Queensland.

(6) Studies on naturally occurring selenosis in Queensland.

(7) Studies on the toxic principle in certain poisonous plants.

TOXICOLOGY SECTION.

Diagnostic Service.

Specimens were received from 364 cases where poisoning of livestock was suspected. Analysis confirmed arsenical poisoning in 48 cases, lead in 11, phosphorus in two and nitrate in one. A variety of miscellaneous samples was also examined, including plant specimens for hydrocyanic acid and nitrate, stock foods for sodium chloride, urea and zinc, and ingesta for organic acids and phenol.

There has been a marked increase in the number of samples submitted from dipping vats throughout the State. Of the 854 samples submitted, 103 were arsenical preparations and the remainder contained chlorinated hydrocarbons. Samples are analysed and the findings reported promptly to ensure economic maintenance of the tickicide at effective strength. Field officers and most private owners have received comprehensive instructions on maintenance, stirring and sampling the vats charged with chlorinated hydrocarbons. In one locality a commercial firm has arranged for the collection of samples and, based on analyses by this Branch, the distribution of advice on the amount of concentrate required to bring the vat to effective strength. This service is not limited to any one proprietary. In appreciation of this service a generous gift of apparatus has been made to the Toxicology Section.

Investigations.

A paper on the selenium toxicity problem in Cape York Peninsula was published in the *Queensland Journal of Agricultural Science*. Selenosis, which so far has been confined to horses, is associated with the ingestion of *Morinda reticulata*. This plant appears to be confined to the Cape York Peninsula. All evidence supports the conclusion that this is a selenium accumulator plant, showing particularly high levels of selenium in young leaves. Outbreaks of selenosis in horses in this locality are associated with the growth period of the plant.

The investigation of selenosis in north-western Queensland has continued. Toxic levels of selenium have been found in all plant specimens submitted from the locality under study. The affected area appears to be more extensive than first thought. Soil selenium concentration is high but the source of this selenium has not yet been elucidated.

Only intermittent work was possible on the chemistry of the toxic principle of *Acacia georgina* (gidyea), the pods of which have been incriminated as the cause of Georgina River disease in north-western Queensland. Arrangements have been made to examine *Indigofera enneaphylla*, the plant established as the cause of Birdsville disease in horses in south-western Queensland.

Investigations are in progress on the vat behaviour of two DDT proprietaries. This work is being done in south-eastern Queensland in collaboration with the N.S.W. Board of Tick Control. Information to date confirms that crystal type and consequently vat behaviour with regard to stripping, settling and stirring are characteristics of the vat rather than the proprietary and are related to conditions pertaining when the emulsion is crystallizing in the vat. Tick control has been satisfactory with both proprietaries. From observations made, failure to eradicate ticks by fortnightly dipping appears to be related to the mechanics of vat dipping and post-dipping milking practice rather than ineffectiveness of the acaricide or shortcomings in the vat behaviour of the proprietary.

Pen trials are also in progress to examine the biological efficiency of a number of DDT proprietaries used in the control of cattle ticks.

BIOCHEMISTRY SECTION.

Diagnostic Service.

Blood inorganic phosphate analyses were made on 1,600 samples representing 227 properties. The field diagnosis of phosphate deficiency was confirmed on 101 properties, while on 41 the phosphate status was classed as marginal. Plate 1 has been compiled from the data on diagnostic samples received in 1956-57 and 1957-58 and shows the distribution of phosphate deficiency in livestock as judged solely from samples submitted during these two years. Each dot represents the location of a property in which phosphate deficiency in livestock has been confirmed.

Plate 1.—Distribution of Phosphate Deficiency in Stock Based on Samples Examined in 1956-58. (Localities shown by dots.)

Blood copper levels were determined on some 1,000 samples representing 217 properties. Copper deficiency was confirmed on 12 properties and a marginal status indicated on 14. The high proportion of negative findings is related to the absence of a clinical symptom which is specific for copper deficiency in cattle. Plate 2 shows the distribution of copper deficiency based on the analysis of diagnostic blood samples received in 1956-57 and 1957-58.

Plate 2.—Distribution of Copper Deficiency in Cattle Based on Samples Examined in 1956-1958. (Localities shown by dots.)

Liver vitamin A analyses confirmed the field and pathological diagnosis of vitamin A deficiency in fowls from four properties and pigs from five properties. A marginal vitamin A status was indicated on three poultry and five pig farms.

In suspected cases of milk fever in cows, the analysis of serum confirmed hypocalcaemia on five dairy farms, four of which showed an associated hypermagnesaemia. Hypomagnesaemia was established on a further three dairy properties.

Some 1,000 miscellaneous samples were examined. These included pasture, silage, hay and stockfeeds to determine feeding value. Other determinations were made in connection with specific disorders in livestock and included analyses for carotene, thiamin, riboflavin, manganese, molybdenum, inorganic sulphate, fluorine, nitrate, oxalate, differential serum protein, blood haemoglobin, met-haemoglobin and bilirubin.

Investigations.

Copper.—Three long-term copper metabolism studies have been continued at the Rocklea Animal Husbandry Research Farm, where earlier observations established a low copper status in Hereford cattle grazing the predominantly paspalum pasture.

The first trial has shown that whereas Merino sheep usually maintain adequate copper reserves, Hereford cattle grazing the same pasture have very low copper reserves. Pregnancy does not appear to influence the copper status of either species. Analyses of liver biopsy samples taken from lambs and calves at birth show adequate copper levels. Repetitive liver biopsies at monthly intervals show that lambs tend to maintain their initial copper reserves whereas the high copper levels in calves at birth (average 450 p.p.m. copper in the dry matter) fall to low levels (average 20 p.p.m. copper) in approximately four months.

The second trial was to examine factors in the predominantly paspalum diet which interfere with copper metabolism in cattle. Pen trials have shown that molybdenum in the presence of inorganic sulphate exerts a similar interference with copper metabolism in both sheep and cattle. The interference factor in paspalum pasture does not appear to be related to the molybdenum content. This factor appears to be variable but seemingly exerts the maximum effect when the protein content is highest.

The third trial is essentially one of pasture management. One group of Hereford heifers is on rotational grazing; the other matched group is on set stocking. An equal number of animals in each group has been kept copper adequate by repetitive intravenous injection of copper sulphate. Untreated animals have shown low liver copper reserves. There is a trend in weight gains in favour of the copper supplemented sub-group on rotational grazing.

Phosphate.—Data have been obtained from 107 dairy properties in south-eastern Queensland. On some of these properties at certain seasons, the pasture eaten was deficient in phosphate and/or protein and/or calcium but the main cause of low production was insufficient intake of feed. Regressions have been developed relating the phosphate, protein and calcium levels in faeces to the concentration of these constituents in the diet selected by the grazing animal. The findings offer an additional diagnostic method in determining the nutritional status of grazing animals. This study is being prepared for publication. The method is being applied to two grazing trials with beef cattle, one on a predominantly *Axonopus affinis* (narrow-leaf carpet grass) and the other on a predominantly *Paspalum dilatatum* pasture.

Biochemical observations have continued in field trials designed to measure the production responses in cattle from supplementation with phosphate in some areas where a deficiency has been diagnosed. Three methods of supplementation are being used—topdressing with superphosphate, treatment of the drinking water, and the use of a bonemeal lick. All are long-term projects.

Vitamins.—A study on the effects of vitamin A deficiency in the laying fowl was published in the December, 1957 issue of the *Queensland Journal of Agricultural Science.*

A number of pilot trials was made to examine the effect of vitamin E supplementation (20 I.U. orally per week) to chickens on rations containing animal protein from various sources. With one proprietary meatmeal the growth rate of chickens was satisfactory and there was no response to vitamin E. With another, the growth rate in chickens was poor. This was due largely to the low biological value of the protein, but there was some growth response to vitamin E supplementation. With bloodmeal, poor growth rate in chickens was due partly to unpalatability and partly to the low biological value of the protein. With whale meatmeal oral administration of the dose of vitamin E markedly increased the growth rate of chicks and prevented the haemorrhagic syndrome associated with the feeding of whale meatmeal to chickens. When included in the

ration, however, 20 I.U. of vitamin E per lb. feed did not give complete protection, although this level is in excess of accepted recommendations.

The 2-year survey data on the vitamin A and carotene status in butterfat from 12 dairying centres have been assembled for publication. Although there are seasonal and breed variations, the vitamin A potency of Queensland butter is higher than that recorded for other countries. Maximum values occur from midwinter to early spring.

Conserved Fodder.—Digestibility studies have been made on paspalum as freshly cut pasture and as hay. The hay was of very good quality but these studies showed that respiration losses during curing and mechanical losses of the more nutritious portions of the plant during harvesting lowered the starch equivalent value of the hay below that of the pasture from which it was made.

Studies have been made to compare the quality, palatability and feeding value of paspalum silage conserved with and without additives. The additives used were sodium metabisulphite (8 lb./ton) and molasses (40 lb./ton). A number of test silos, each of about ¾-ton capacity, have been installed for this work. Harvesting was by means of a forage harvester which was set to cut pasture in about 1 in. lengths. Fermentation losses were low in all three silages. Quality tests were in favour of the treated silages but indicated that higher levels of each additive may be necessary for optimum quality. There were significant differences in palatability of these silages, the order of preference being metabisulphite, molasses, untreated. Treated silages showed a statistically significant increase in dry matter digestibility, largely due to a significant increase in the digestibility of the carbohydrate fraction. This work will be continued.

Digestibility trials are in progress on sorghum silage, of which there is a large amount conserved in pits in western Queensland. It is recognised that a major problem in the use of this silage as a drought fodder is the low protein content, which is below the maintenance requirement of adult stock. The utilisation by sheep of urea, added as a protein supplement either as the sorghum is ensiled or when it is fed out, is being examined.

DIVISION OF DAIRYING: BRANCH REPORTS.

FIELD SERVICES BRANCH.

Mr. F. C. Coleman, Director of Field Services.

The depressing outlook at the beginning of the year quickly changed early in July as a result of sufficient rain falling in south-eastern Queensland to relieve the four months' drought. This, unfortunately, was not followed up by further rain and a further three months' dry spell ensued. Bush-fires blazed across big areas of central and southern Queensland and the drought tightened its grip on farm lands. Scattered storms on the Darling Downs and in the Lockyer Valley and South Burnett districts brought temporary relief to some areas at the end of October. The situation in January had again deteriorated but fortunately good general rains fell at the end of that month and by the end of March the drought, one of the most serious on record, terminated. The year closed with general soaking rains, creating a near-record for the month of June and in complete contrast with the drought conditions which existed exactly 12 months earlier.

The 12 months under review were compounded of misfortunes which dealt the dairy industry in Queensland a severe blow. First, the drought caused heavy losses in production and stock. The loss in income from butter and cheese alone has been estimated at more than £5,000,000, and to this must be added decreased returns for pigs, £320,000 advanced by the State Government for drought relief, value of fodder purchased by farmers, and losses of dairy stock. Then there was a precipitous fall in the price of butter and cheese on the United Kingdom market. The price of butter fell from 319s. per cwt. in June, 1957, to 205s. per cwt., the latter figure representing a price well below the Australian cost of production. Cheese also suffered in the price decline, prices falling from 190s. to 145s. per cwt.

As a result of the over-supply of dairy produce and unprofitable prices on the United Kingdom market, some farmers have already turned their attention to other avenues of production such as the growing of grain crops, beef cattle fattening, sheep raising and cotton growing, with the result that there has already been some reduction in the number of dairy farmers.

BUTTER PRODUCTION.

As the year progressed, the increasing severity of the drought was reflected in lower levels of production and quality, so that only 32,280 tons were manufactured, compared with 41,089 in the previous season, and only 32.8 per cent. of butter was officially graded as choice quality, compared with 34.3 per cent. in the previous year.

Production of milk and cream of high quality is never easy under the State's climatic conditions, but added to the difficulties this year were inadequate water supplies and extremely hot, dry weather conditions. One mitigating influence, however, was that defects due to weed taint were not so prevalent.

Bad seasons notwithstanding, the maintenance of factory buildings and equipment has to be provided for and thus, despite adversities, an amount of £144,600 was spent, this being greater than the previous year's expenditure. It can be said that the 49 butter factories are all in good structural condition.

The industry continues to keep pace with progress, as can be seen in the installation of metal churns and improved cream processing units. The metal churn is ousting the wooden churn and this should assist in quality improvement, as wooden churn barrels in a number of factories are showing evidence of fungal decay. Ten metal churns will soon be in operation, indicating factory acceptance of these more satisfactory units. Improved cream processing equipment continues to be installed. Several modified vacreators were introduced, and a new cream treatment unit was installed in the Boonah branch factory of the Queensland Farmers' Co-operative Association, this being the third such unit installed in the State. A recognition of the importance of extraneous matter in butter has resulted in several factories utilising equipment for the removal of such material from the cream during processing. Special factory surveys were conducted by the Field Services Dairy Technologist to investigate causes of butter degrading and poor bacteriological condition of butter.

CHEESE PRODUCTION.

For the reasons mentioned in the case of butter, and because additional supplies of market milk for Brisbane were drawn from cheese factories, production of cheese was reduced to a low level, the amount manufactured totalling 5,174 tons, compared with 7,137 tons in the previous year.

The structural condition of all 26 factories is satisfactory. An amount of £59,012 was spent on new equipment and renovations, this being considerably more than the expenditure in the previous year.

There was a marked improvement in quality, 88.2 per cent. of choice and first grade cheese being manufactured. This could be attributed partly to the introduction of milk grading regulations whereby an additional 2d. per lb. butterfat is paid for first grade milk and partly to an improvement in manufacturing methods. Officers have also played an important part in the work of quality improvement.

Improved waxing, the packaging of rindless cheese, and the manufacture of lower moisture cheese are practices now being employed by a number of Associations. The high standard of equipment now being installed in the modern cheese factory should assist materially towards obtaining the improvement in quality for which the industry is striving. Such equipment reduces the drudgery formerly associated with cheese-making and thus improves the working conditions for factory personnel.

The manufacture of Edam cheese, which was initiated at the Warwick Co-operative Dairy Association's factory last year, was continued successfully, and the Downs Co-operative Dairy Association at Toowoomba manufactured small quantities of Roman cheese.

An Advanced School for Cheesemakers, conducted at Gatton College by the Australian Society of Dairy Technology, the Department of Education and the Department of Agriculture and Stock, attracted 15 cheesemakers and proved very successful.

MARKET MILK PRODUCTION.

Market milk supplies for the city of Brisbane were only maintained by costly hand-feeding of dairy herds during the drought. During the year there was no milk shortage in Brisbane. Dry conditions in North Queensland were responsible for a milk shortage at Cairns towards the end of the year. This was met by the long haulage of milk by a rail milk tanker from Caboolture to Cairns (1,005 miles).

No new pasteurisation factories were established during the year.

Despite the drought, milk quality as revealed by the methylene blue test was satisfactory. The compositional quality, however, was affected, causing a deficiency of fat and solids-not-fat in the milk from a large percentage of herds. Rejection of a number of tanker loads of milk for bottling purposes was necessary to ensure that compositional standards were maintained.

Long-distance haulage of pasteurised milk to Charleville and Cunnamulla for distribution in those centres has proved successful.

The consumption of milk in the city of Brisbane has continued to increase steadily, having risen from 18,000,000 gal. to approximately 18,500,000 gal. during the year. The amount of table cream consumed in Brisbane was 104,045 gal., compared with 115,000 gal. in the previous year.

The winter incentive price to milk producers was continued throughout the whole of the summer period. The price to producers supplying milk direct to Brisbane factories was 3s. 7¼d. per gal., which is equivalent to 9s. 2d. per lb. butterfat. The return to producers to country factories is reduced by handling charges incurred in treatment and despatch.

Expenditure on milk factory plant totalled approximately £100,000.

DAIRY PREMISES AND EQUIPMENT.

Hygiene.

Because of depleted tank-water supplies and the reluctance of farmers to replace rubberware and to buy detergents because of lowered incomes, a reasonable standard of hygiene was maintained only with difficulty. Men fighting to prevent their cattle from dying, and with little or no income, can hardly be expected to give the same attention to hygiene as they would under normal conditions. In those districts where co-operative dairy associations impose financial penalties for unsatisfactory milk quality, the standard of hygiene was more satisfactory. There is a brighter side to the picture on the Darling Downs, where an overall improvement in hygiene is reported. This is attributed to the introduction of differential payments for milk for cheese manufacture and to increased farm visits by officers.

A fillip was given to improved hygiene by 10 successful hygiene days which were organised by the Eastern Downs Dairy Extension Advisory Committee.

Structural Condition.

The necessity for farmers to keep a tight rein on expenditure curtailed the erection of new dairy premises to some extent but the progress made was better than might have been expected. There has been a marked improvement in the standard of dairy premises. The type still most widely favoured is the combined dairy building. Farmers are realising the advantages of ceiling the entire building and this is gaining favour; so, also, is the cementing of exit races and small inner holding yards. Dairymen are also more easily convinced regarding the painting of premises and most of the new premises are now being painted. Contrary to expectations the tubular steel shed has not made much headway. It has been noticed that an unusual amount of noise from engine echo emanates from metal sheds.

Plate 1.—Modern Dairy Premises on the Atherton Tableland.

The number of new premises erected was 276, compared with 529 in the previous year, while 364 premises were renovated, compared with 466.

Herringbone Milking Shed.

Innovations are usually accepted cautiously until proven, but had the weather and economic conditions been good it is believed that more of these sheds would have been erected during the year. Data obtained from herds which have been milked in the walk-through type of shed have been compared with those obtained when the herds have been transferred to the herringbone

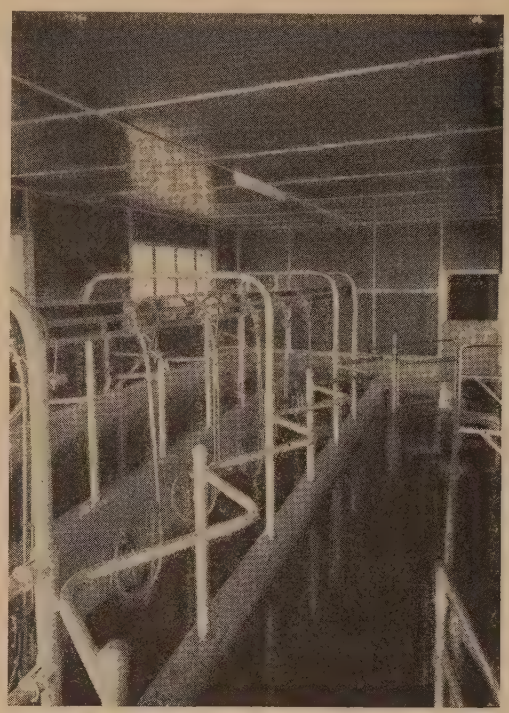


Plate 2.—Herringbone Milking Shed, Gympie District.

shed. All claims made for the latter appear to have been substantiated: there is no difficulty in handling the herd, stooping is eliminated, milking is less arduous, working conditions are more comfortable and time is saved. Owners are enthusiastic. The amount of time saved is exemplified by two cases, in one of which time improved from 25.2 cows per hour per man to 42 cows per hour per man, and in the other of which the improvement was from 30 cows per man per hour to 40.5.

Hot Water Facilities.

Electrical equipment continues to contribute neatness, cleanliness and quietness to the modern milking shed, and this is of some importance to hygiene and management of the herd. The extension of electrification in rural areas continues apace, with a corresponding change-over from copper boilers and steam sterilizers to electric water heaters. Steam sterilizers are ideal when properly handled, but the initial cost, short life when hard water is used and shortage of wood in some districts reduce their popularity. Copper boilers of the requisite capacity continue to give satisfactory results. New installations were as follows: copper boilers 534, steam sterilizers 101, and electric heaters 477.

Milking Machines.

Firms manufacturing these plants are continually vieing with each other and striving to produce the best possible equipment. One make of machine was remodelled during the year and another is being remodelled. A search is also being made by the trade for comparably-priced substitutes for tinned brass and rubber. Stainless steel tubing is readily available and is probably the best material known at present, but it is still costly in comparison with tinned brass. Pyrex glass tubing made its appearance this year, and one company is now using it for milk lines; reports from officers indicate that it represents an advance in milking machine equipment.

During the year 763 machines of various makes were examined by officers using the milking machine testing equipment. The results are as follows:—Insufficient air

reserves for proper operation, 60 per cent.; worn vacuum pumps, 29 per cent.; excessive air leaks, 38 per cent.; inaccurate vacuum gauges, 58 per cent.; incorrectly adjusted pulsators, 37 per cent.; and faultless, 9 per cent. Farmers continue to be very appreciative of this service.

In-place equipment is being installed with most new milking machines and thus its use is slowly but gradually extending. About 1,200 plants have now been installed. Efficiency of the equipment depends on the individual and good results are obtained when the instructions are faithfully carried out. The contribution to quality resulting from its adoption has, so far, not been significant. Many farmers appear to believe that in-line cleaning eliminates the need for periodical dismantling and cleaning. As a large percentage are not using the equipment efficiently, increased advisory work by officers is necessary.

Machine Stripping.

Usually the younger members of the dairying community are more receptive of ideas and more amenable to change than are the older members. Those who have made the change from hand-stripping to machine-stripping are well satisfied, and those who are reluctant to do so may be encouraged by the fact that certain stud breeders have commenced machine-stripping. In order that this practice may be effectively carried out it is essential that the milking machine be in good working order. The improved efficiency of machines following testing with the Ruakura equipment has increased the number of those who have discontinued hand-stripping. There are now more than 5,000 dairy-farmers of a total of 19,000 (28 per cent.) who are machine-stripping. In the Toowoomba Senior Adviser's District 53 per cent. are doing so.

Cooling of Milk and Cream.

Farmers have become increasingly conscious of the necessity and advantages of refrigeration in the sub-tropical climate of this State. Its general adoption, however, has so far been prevented by the cost and the adverse economic conditions now existing in the dairying industry. As the disastrous drought continued to take its toll, many farmers who had decided to install refrigerators cancelled their orders. Those who did install them during the year were mainly market milk suppliers. Approximately 444 refrigerators were installed, compared with 235 in the previous year. There are now 2,135 refrigerators in use.

Water cooling towers have demonstrated their ability to assist in improving quality; this refers to both milk and cream cooling. The cooling tower appears to be a better proposition for cream than the charcoal cooler. Totals of 71 tower coolers and 13 charcoal coolers were constructed during the year.

The three American in-the-tank or drop-in cream refrigerators which have been demonstrated under the Commonwealth Dairy Industry Extension Grant have proved satisfactory.

FODDER CONSERVATION AND PASTURES.

Fodder reserves on dairy farms at the beginning of the year were probably higher than they have ever been. As the drought continued, however, three fodder surveys were carried out by officers and these revealed the inadequacy of the reserves. Had the drought not been broken in March the losses would have been very serious. Assuming that stocks were almost exhausted at the end of the drought, good progress has evidently been made during the last two or three months, as approximately 132,000 tons of hay, silage and grain were estimated to be available on dairy farms in June.

Despite unfavourable conditions for pasture establishment, there was a steady trend towards improved pastures. A pleasing feature about the rain-grown

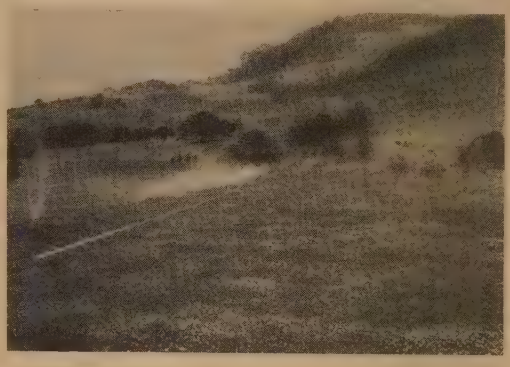


Plate 3.—Irrigated Dairy Pastures at Cooroy.

pastures was the response, after the drought-breaking rains, of some of the newer grasses such as green panic and buffel. Many of the irrigated pastures suffered from lack of water, but where supplies were unrestricted their value was inestimable. It is estimated that about 3,200 dairy farmers in recent years have planted approximately 42,000 acres of improved pastures.

Plate 4.—A Dam at Cooroy Holding 10 Million Gallons.

SEASONAL CALVING.

It is estimated that nearly 5,000 dairy farmers are now practising seasonal calving, which is the term given to the practice of calving the whole, or a big percentage, of the herd within a limited and most favourable period.

COMMONWEALTH DAIRY INDUSTRY EXTENSION GRANT.

Farm Demonstrations.

Dryland and irrigated pasture demonstrations received a severe setback during the drought and some species disappeared altogether. The imposition of pumping restrictions, the failure of water supplies and changes in the chemical composition of some creek and well waters caused the failure of about one-third of the irrigated pasture demonstrations.

Silage-making demonstrations were doubled compared with the previous year. All trench silage was conserved for about £1 15s. per ton. At the time the silage was fed during the drought, lucerne chaff was selling at £30 per ton.

An analysis of the projects is as follows: Rain-grown pasture, 77; irrigated pasture, 28; fodder conservation, 22; others, 4; total, 131.

Once again the drought year restricted the number of field days on demonstration farms, as improved pastures must be at an impressive stage before a field day is justified. Only 11 field days were held during the year, with attendances averaging 70 people. Conducted tours maintained their popularity and eight were held on which one or more C.D.I.E.G. farms were visited.

Quality Improvement Demonstrations.

New dairy detergents have been demonstrated under various conditions in several districts. These have given good results when applied with and without recirculation cleaning methods. Stone deposits caused by hard water supplies can be minimised by the use of improved dairy detergents.

Farm cooling of milk and cream was demonstrated in all districts. The three American drop-in refrigerators operated very successfully throughout the year. A modified version of this type of milk and/or cream refrigerator is to be manufactured in Brisbane. A big feature in favour of this type is that the unit can be easily removed from the tank and taken to the nearest depot for servicing. A spare unit can also be lent to the farmer while servicing is done.

Evaporative cooling methods were demonstrated with 34 cream cooling and 15 milk cooling towers.

A solar water heater which it is hoped will provide cheaper hot water for dairy purposes has been in operation on a Darling Downs farm. Figures on the cost of boosting the hot water up to boiling point by the use of electricity will be available in the near future.

It has been demonstrated on farms that the life of dairy rubberware can be lengthened by increasing the percentage of synthetic rubber in relation to natural rubber.

At certain times of the year the problem of low fats and low solids-not-fat is a serious one. Information obtained on several farms indicates that the percentage of both these milk constituents can be raised by a higher plane of nutrition. The investigations are being continued.

EXTENSION WORK.

The objective of carrying extension to greater numbers of farmers without increasing staff is being achieved, as the following figures show:—

	Farm Visits.	Other Media.	Total.
1955–56	23,643	16,321	39,964
1956–57	17,454	9,413	26,867 *
1957–58	21,463	15,768	37,231

* Mileage restrictions operating.

Details of attendances at field days, tours, etc., organised during the year, and those for the previous year, are shown in Table 1.

TABLE 1.

ATTENDANCES AT EXTENSION GATHERINGS.

	1956–57.			1957–58.		
	No.	Attendance.	Average.	No.	Attendance.	Average.
Farm Walks	..	..	..	19	290	15
Illustrated Talks	87	2,284	26	68	1,516	22
Field Days	19	1,669	88	47	3,618	77
Tours	15	2,490	166	18	1,516	84
Method Demonstrations	48	453	9	93	1,155	12
Annual Herd Recording Meetings	18	592	33	60	1,777	30
Film Evenings	30	1,000	33	49	2,320	47
Project Clubs	10	107	11	37	939	25
Junior Farmers' Meetings	54	818	15	90	2,315	26
Discussion Groups	..	..	..	8	286	36
Q.D.O. Meetings	..	..	..	4	36	9
Total	281	9,413	..	493	15,768	..

Commonwealth Grant funds were used to prepare an attractive exhibit featuring milk quality which was displayed at the Royal National Exhibition and large country centres.

Illustrated Talks.

Illustrated talks to Queensland Dairymen's Organisation branches have been given in association with officers of the Divisions of Plant Industry and Animal Industry, and although attendances were affected by the unfavourable season, much interest was displayed in slides dealing with dairy hygiene and premises, milking machine care and maintenance, cheese milk production, herd recording, cooling milk and cream, fodder conservation, pastures, etc. Five new sets of slides were produced during the year, featuring Shade, Shelter and Water; Useful Aids on the Dairy Farm; Calf Identification; Sire Surveys; and a special series of technical slides which were supplied for screening to butter factory staffs. Four screenings of the lastmentioned were made. Ten sets of coloured transparencies, featuring a variety of subjects, are now available to all officers.

Film Nights.

A total of 49 film nights comprised extension activities with this medium. These have been well received, as technical information is portrayed in an entertaining form and something is provided for the whole family. Officers of the Divisions of Plant Industry and Animal Industry attended whenever possible. The stage is being reached when additional films will be required, some farmers having already seen the Departmental films more than once. The Commonwealth film on hygiene entitled *It's in Your Hands* is expected to be available shortly; also a film dealing with herd recording and another entitled *Travelogue Through the Dairy Districts*. Films are in strong demand on the Atherton Tableland, and a third projector is being obtained to permit one being retained at Malanda.

Farm Walks.

Officers were encouraged to initiate farm walks. Nineteen were organised and the response suggests that they will become popular. The organising of farm walks is less of a strain on an officer's time than field

days, tours, etc., and an additional advantage is that the farmer whose property is being used himself gives testimony, with appropriate Departmental officers being present to answer any questions as the groups move round the crops, pastures or whatever is being shown. Visual extension methods are undoubtedly appreciated by farmers, who also appreciate the more personal attention and the discussion which results. A number of farm walks were arranged with the object of showing small groups of farmers modern milking sheds and equipment. A gratifying percentage of these have since erected modern premises themselves.

Conducted Tours.

This extension medium has caught the imagination of dairy farmers and is by far the most popular. The attraction is the novelty of visiting more than one farm for the day's outing and witnessing an interesting variety of demonstrations. Farmer participation and testimony are featured in these events, of which those attending speak highly. Officers have now had three years' experience in the planning of these events, which call for a high degree of organising ability if they are to be successful. Eighteen tours were arranged; this is very satisfactory in view of the drought conditions existing.

Field Days.

Field days emphasising the benefits of pasture improvement, water conservation and fodder conservation were arranged. Some of those featuring fodder conservation were highly successful, as they were conducted at strategic times in order to capitalise on various aspects of this work. Despite the weather conditions, 47 field days were held. It is anticipated that when the water harvesting demonstrations organised under the Commonwealth Grant are properly established, field days will be held which will attract large numbers, as the importance of this practice has been vividly impressed on farmers during the past year.

Method Demonstrations.

Demonstrations including hay-making and silage-making, removal of stone deposits from milking machines, dairy hygiene and the cooling of milk and cream by the tower method have been held with good results. Effective work was carried out by officers in milk-producing areas in organising method demonstrations aimed at reducing the thermodurie bacteria count of market milk supplies. The care and maintenance of milking machines and the use of the Ruakura air-flow meter and vacuum recorder have again been featured.

Junior Farmers.

The Junior Farmer Movement is receiving ever-increasing attention and assistance from officers. Ninety club meetings and field days, at which 2,315 junior farmers were present, were attended. Films and slides were shown and talks given. Some officers spend much time with Junior Farmers and attend their meetings as advisory members, thus establishing a good relationship with those young people which should bear good fruit in the future.

Discussion Groups.

The number of discussion groups is growing and interest is increasing. There were very good attendances at all meetings when guest speakers addressed the members.

Other Methods.

Officers made good use of the Press and radio, contributions including 21 articles for the *Queensland Agricultural Journal*, four A.B.C. Country Hour talks, 15 radio tapes for country radio circulation, 30 news bulletin items, and numerous press releases.

Photography.

The Branch now possesses a library of 1,058 coloured transparencies, compared with 300 in 1954-55. Good use of cameras is being made in most districts.

Dairy Extension Advisory Committees.

Additional committees were formed during the year and there are now nine functioning, each representing a district of the Queensland Dairymen's Organisation. They appear to have worked smoothly and by co-operating in the organisation of many extension activities have done much to foster practices which have been proved successful in the respective districts. These Committees are becoming accepted by farmers as bodies which will prove valuable to the dairying industry. Co-operation between the Department and the Queensland Dairymen's Organisation is also being further improved as a result of D.E.A.C. activities and extension work has thereby been assisted. It is believed that the Committees will play an important part in the rural activities of each district.

HERD PRODUCTION RECORDING.

The low price of dairy products on the United Kingdom market makes it essential for dairymen to reduce the cost of production, and a practical method of doing so is to replace as many low-producing cows as possible with better animals. Herd recording distinguishes not only the low producers but also the superior cows with which to replace them. However, only 7 per cent. of the commercial herds in the State are being recorded; therefore the replacement of large numbers of unprofitable cows will be delayed until recording is further extended.

The cost of herd recording is causing concern in most countries, and although fees in this State are 2s. 6d. per cow below the lowest fee in other States, investigations aimed at a cheaper method of recording are being made.

The membership of individual groups has become more stable in recent years. Initially, many dairymen decided to record their herds for one or two years only, but subsequently, appreciating the necessity for continuous recording, continued in the scheme.

Some herds have shown spectacular improvement through consistent recording. One Monto farmer, by judicious culling of low producers and general farm improvement, raised the average production from 120 lb. butterfat in 1952-53 to 237 lb. butterfat in 1956-57, an increase of 97 per cent. in four years. Many other examples of increases in production could be mentioned.

Pure-bred Production Recording.

This scheme is conducted to provide information to the dairying industry on the productive capacity of cows in purebred dairy herds. It is from this source that commercial dairymen buy bulls to breed herd replacements which will be at least as good as or preferably better than those they replace. For herd improvement purposes, bulls are selected according to the production records of their female relatives.

Stud herds should consist of animals of better-than-average production to ensure that male stock will beget daughters capable of increasing the production of commercial herds. To bring them to this standard, and to demonstrate the proof to others, the herds should be recorded. Unfortunately, less than 10 per cent. of the registered breeders record their herds.

During the year, cows from 118 herds were submitted, compared with 119 herds in the previous year.

The required age production standard was yielded by 660 cows, compared with 939 in the previous year; 1,078 failed and 234 were withdrawn. The large number of withdrawals was due to the drought.

The average production of cows which completed lactations of 300 days or less is shown in Table 2.

TABLE 2.

AVERAGE PRODUCTION OF PUREBRED COWS, ACCORDING TO BREED.

Breed.	No. of Cows.	Average Production.		
		Milk	Test.	Butterfat.
		Lb.	%	Lb.
A.I.S.	741	7,202	4.1	293
Ayrshire	58	7,775	4.2	323
Friesian	71	7,399	3.5	258
Guernsey	105	5,478	4.5	248
Jersey	762	5,317	5.2	275
Red Poll	1	1,542	4.3	66
Total	1,738	6,280	4.5	281

The eighth annual report on Pure Bred Production Recording was distributed to dairymen. These annual reports are being used for reference purposes

During the year the A.I.S. cow "Sunny View Little Princess 20th", owned by Messrs. J. Phillips and Sons, Kingaroy, established a production record for Australia for a Junior-4-year-old cow. In 300 days she produced 24,630 lb. milk and 1,053 lb. butterfat.

Plate 5.—"Sunny View Little Princess 20th."

Register of Merit.

The Register of Merit was introduced so that a permanent record of superior producing strains of cattle will be available to dairy-farmers. In order to enter the Register, animals must give proof of their ability to calve regularly and give consistently high yields of milk and butterfat. Dairymen are showing greater interest in the records of cows entered in the Register of Merit.

In 1957-58 two cows qualified for entry into the Elite Section, for which a minimum production of 3,600 lb. butterfat is required. This raises the total number of Elite cows to seven. Fifteen cows qualified for entry into the Lifetime Section (2,240 lb. butterfat), compared with seven in 1956-57, and 102 cows were admitted to the Intermediate Section (51 in 1956-57).

Details of cows in each breed admitted to the various sections during 1957-58 are shown in Table 3.

TABLE 3.

COWS ADMITTED TO THE MERIT REGISTER IN 1957–58.

Breed.	Section of Register.		
	Elite.	Lifetime.	Intermediate.
A.I.S.	1	8	56
Ayrshire	—	—	4
Friesian	—	—	—
Guernsey	—	—	2
Jersey	1	7	40
Total	2	15	102

Goats.

The number of goat herds recorded was 12, compared with seven in 1956-57. Lactation periods were completed by 63 goats and the average production was 1,440 lb. milk and 56 lb. fat. Recent reports show that a number of purchasers of goats are selecting animals according to their production records.

Group Herd Recording.

The year 1958 marked the completion of 10 years of group herd recording. The drought prevented the anticipated expansion of the service during the 1957-58 period. Many herds were withdrawn from recording and the membership of some groups reached a low level. When recorders resigned they were not replaced, but officers in adjoining areas serviced the groups concerned. At the end of the year, 71 recorders were servicing 80 groups. During the year three new groups were commenced. Three were closed owing to the low membership, and the remaining members were transferred to other groups.

The herd recording year ended on Sept. 30, 1957. During this period 59,711 cows from 1,466 herds completed lactation periods of 300 days or less. The average production of these animals was 3,508 lb. milk and 149 lb. butterfat. The average butterfat content of the milk was 4.2 per cent. Considering the adverse seasonal conditions, this result compares favourably with that of the previous year, viz. 3,563 lb. milk and 155 lb. butterfat. It is noteworthy that many recorded herds suffered little or no loss of production during the drought. These herd owners have realised the necessity of maintaining adequate supplies of fodder to cover all emergencies.

The issuing of monthly progressive production total sheets for each individual cow has proved to be very acceptable to the owners.

A simple shed sheet was designed and supplies printed. These have been issued free of charge to members of the groups, who have expressed appreciation of their value. The sheets enable members to keep better records of each cow in the herd, such records being valuable to the farmer himself as well as supplying information for herd recording surveys.

The monthly publication, *Recording Notes*, issued by the Herd Recording Section is well received by recording farmers. It contains information on herd recording and surveys, as well as on husbandry and proved farming practices.

Surveys.

Surveying of information derived from herd recording and of various farm practices continues to be one of the main functions of the Herd Recording Section. Some of the surveys are discussed below.

Sire Surveying.—This is perhaps the most important adjunct to herd recording, as it is only by the examination of the production of his daughters in comparison with that of the remainder of the herd that the value of a bull can be assessed.

During the year surveys were made on 139 bulls. Of these, 45 were found to be increasing the production of the herd, 63 maintaining it, and 31 lowering it. Dairymen are showing a better appreciation of the value of these surveys than previously. With the keeping of better records it is anticipated that the demand for them will show a big increase each year.

Calf Identification.—A calf identification service is offered to group members to provide reliable information regarding the parentage of heifers. All heifer calves are ear-tattooed at birth so that when they enter the herd they can be positively identified. This is essential for the accurate completion of sire surveys and in the examination of cow families as well as for

the farmer's breeding programme. During the year, 8,067 calves in 729 herds were tattooed. A series of coloured transparencies dealing with this work was used by field officers to stress its importance.

Effect of Month of Calving on Production.—This survey was conducted on the 1956-57 results to ascertain whether the adverse seasonal conditions would affect the trend shown during the previous eight years. No significant divergence was observed. Even under the adverse conditions which prevailed, cows which calved during the third quarter of the year again had the highest average production.

Effect of Length of Lactation on Production.—The average length of lactation for the 1956-57 herd recording year was 231 days, the longest ever recorded in this State. The average production of all cows was 149 lb. butterfat, but the average production of cows which milked for 300 days was 200 lb.; only 22 per cent. of the cows were in this group. The lengthening of the lactation period of the remaining 78 per cent. would result in increased production, which would do much to offset lower prices.

Effect of Length of Dry Period on Production.—This survey showed that it is desirable for cows to have a dry period of at least four weeks prior to re-calving. A period longer than four weeks does not appear to be conducive to higher yields.

The relationship between dry period and average production is depicted in Fig. 1.

The treatment during the dry period may be more important than the length of the period in determining the production at the ensuing lactation.

Factors Affecting Level of Production.—This survey was carried out on the Atherton Tableland in conjunction with the local Dairy Extension Advisory Committee. It was found that the following practices were adopted by the owners of the higher producing herds in the area to a greater extent than by the owners of herds of a lower production standard:—(*a*) seasonal calving; (*b*) sire control; (*c*) keeping of records; (*d*) management of pastures; and (*e*) supplementary feeding.

Extension Work.

The Herd Recording Section continues to prepare and forward extension material to officers for use in the field. The annual meetings of herd recording groups were deferred until February and March on account of the drought. Officers of the Herd Recording staff attended many of these meetings. The main theme at the meetings this year was calf identification as an aid to keeping reliable records. A series of coloured transparencies on the subject was provided.

SUMMARY OF FIELD STATISTICS.

Tables 4 and 5 summarise the advisory work carried out by officers of the Division and the Brisbane Milk Board.

TABLE 4.

FIELD STATISTICS, 1957–58.

District.	Farm Visits.	Factory Visits.			Suppliers' Tests.	Factory Tests.
		Butter.	Cheese.	Milk.		
Brisbane	1,803	117	7	144	5,726	118
Brisbane (milk quality control)	1,545	12	6	235	11,605	368
Darling Downs (Toowoomba)	4,071	195	131	15	637	1,231
Darling Downs (Warwick)	2,141	207	158	239	12,321	2,362
Rockhampton	2,469	153	—	77	5,145	276
Maryborough	1,920	161	14	134	1,626	360
Murgon	1,425	127	28	16	238	35
Gympie	2,677	248	41	125	1,932	514
North Queensland	1,223	54	—	126	4,440	143
Ipswich	2,189	246	—	82	1,953	62
Total	21,463	1,530	385	1,193	45,623	5,469

TABLE 5.

BRISBANE MILK BOARD SUPPLIERS AND FACTORY VISITS.

—	Farm Visits.	Factory Visits.
Milk Board Officers	1,972	941
Divisional Officers	3,260	702
	5,232	1,643

A total of 386 orders was issued, compared with 354 in 1956-57. These covered temporary closures of unsatisfactory dairy premises, the erection of new premises or renovation of old ones, the cleansing forthwith of premises where hygiene was poor, and cooling of milk or cream.

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.

It is increasingly evident that the dairying industry desires more technical aid to meet the day-to-day problems now facing it, a trend which is reflected in the ever-increasing number of problems referred for investigation or information and samples received in the laboratories of the Branch.

An active programme of research and quality control schemes was carried out during the year to satisfy this demand, changing circumstances in the industry, and the need for further improvement in quality. In this regard, 27 investigational projects were undertaken and over 130,000 tests were made on 38,000 samples of milk and milk products. The laboratory quality control schemes have done much to stimulate and broaden an appreciation of the technological problems of the industry. However, the fullest co-operation between all sections of the industry and the Departmental technical services is necessary if laboratory results are to be used to best advantage.

Severe drought conditions which seriously affected the quality of farm and factory water supplies caused a marked increase in the number of samples of water received for examination. They also affected the compositional quality of market milk and cheese and interfered with a number of farm and factory investigations.

Priority in investigational work was given to projects aimed at improving the quality of dairy produce, better utilisation of milk solids, and efficiency and economy in production and processing.

Outstanding features of the year's activities included investigations on unsalted and salted butter, extraneous matter in cream and butter, thermoduric bacteria in market milk supplies and the improvement of the compositional quality of milk.

A school for cheesemakers was planned and conducted by officers of the Branch in collaboration with the Society of Dairy Technology and Education Department at Gatton College. The school proved popular and indicated the keenness of the industry to keep abreast of modern technological developments. Similar schools covering market milk and butter are anticipated.

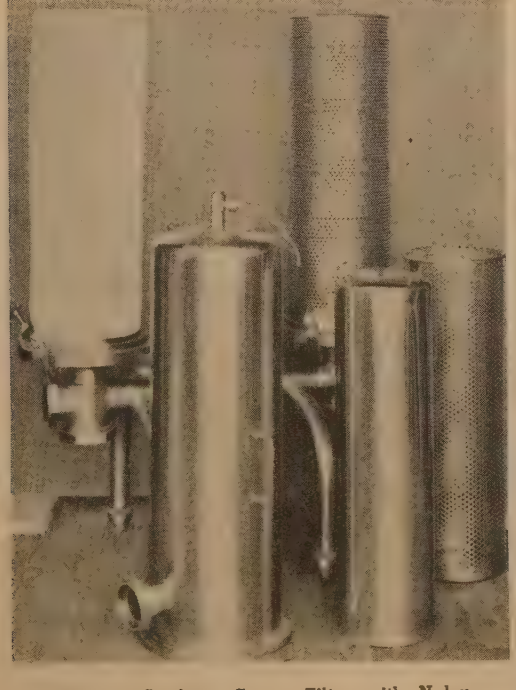


Plate 1.—Stocking Cream Filter with Nylon Cloth.

INVESTIGATIONS.

Problems associated with the production and processing of milk, cream, butter and cheese covered a wide range.

Filtration of Cream.

The examination of butters for extraneous matter has shown the need for some form of cream filtration in butter factories. Work during the year was centred on the design and testing of suitable filters, the most satisfactory type of filtering material to use and the most suitable position in which to place the filtering devices. Of six systems tried, the cheapest and most effective made use of special commercial nylon filtration cloth over stainless steel strainers placed before and immediately after the pasteuriser. Other types tried were a 4-plate and a 24-plate horizontal filter, two stocking-type filters (Plate 1) and a clarifier.

It was shown that the numerous large fat globules in cream from 10 to 20 microns in diameter limit the types of nylon cloth which can be used for the successful filtration of cream. Nylon cloth of a mono-filament weave, with a mesh opening of 35 microns, proved too fine; it greatly restricted cream flow and soon became blocked and caused back pressure on the pasteurising machine. However, nylon of a multi-filament weave (Plate 2) proved satisfactory in allowing the

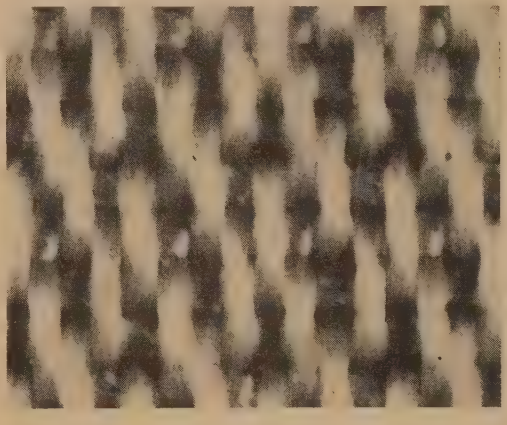


Plate 2.—Multi-filament Woven Cloth for Cream Filtration.

free passage of fat globules, while removing extraneous matter. The degree of stretch in the multi-filament weave appeared to be the critical factor. For an average factory with a cream run of 2–3 hours at approximately 1,000 gal. per hour, a filtering surface area of 12–18 sq. ft. is required.

The positioning of the filters is important. In experimental work the filter was installed between the vacreator and the cooler so that the cream was filtered at about 130 deg. F. Where the cream is preheated to 160 deg. F., it is preferable to filter it prior to pasteurisation. Post-pasteurisation filtration of cream is also necessary for the removal of vacreator scale.

Commercial filtering devices are costly and a cheaper type was sought. One has been designed in association with the Butter Marketing Board and is now undergoing trials.

The clarification of cream was also tried. After pasteurisation the cream was clarified at a temperature of 135–138 deg. F. at 7,000 r.p.m. In one trial, 8.6 lb. dry matter was removed from 900 gal. cream. The bacteriological quality of the clarified cream was slightly improved. The fat percentage of the cream was not affected, nor were fat losses increased in churning. However, the curd content of the resultant butter was reduced by 0.4 per cent. Further trials are proceeding and the effect on keeping quality is being determined.

While a successful system of cream filtration has been achieved for factories, it is preferable to prevent the admission of extraneous matter. To this end a sediment test has been devised for cream, using 50 per cent. hot water with 0.5 per cent. sodium citrate. By this means it has been possible to pinpoint sources of contamination on the farm. It is felt that such a simple test applied at the factory on each supplier's cream would serve as a valuable guide to producers and factories, and the development of a platform test is under consideration. Two papers on this work were prepared for publication.

Cultured Butter.

The difficult position with respect to the marketing of export butter led to an attempt, in association with the Butter Marketing Board, to develop a product with a more attractive flavour in order to increase local consumption of butter. A good market seems to exist for the type of butter to which the European migrant population is accustomed.

The previous year's work showed the inadvisability of producing a high-acid butter for Queensland conditions. However, slight acid development with starter cultures seemed worthy of further investigation. Trials in the culturing of cream with various types of starter cultures were initiated. The types included imported mixed strain cultures, single strains of *S. cremoris* and *S. lactis*, commercial flavour-producing cultures and *S. diacetilactis*. A vigorous diacetyl-producing strain of *S. diacetilactis* proved the best. Six butters with cream ripening acidities varying from 0.16 to 0.23 per cent. were prepared. Within this range the keeping quality of the cultured unsalted butter was good, fat losses in churning were lower than for normal butter, and the product met with good acceptance by consumers. The success of this work prompted an extension of the trials to salted butter. To maintain keeping quality in the presence of salt, it was found necessary to use finely ground salt treated with soda ash. The use of 1–1.3 per cent. treated salt was satisfactory. Half of the tasting panel preferred the fully cultured butter, and the other half favoured a blend of one part of cultured butter to three parts of normal butter. After storage for one month, there appeared to be no effect other than a slight reduction in the original flavour and aroma of the blended butter. The slight unclean flavours typical of some normal butters appeared to be overcome by cream culturing. The effect of mixing various proportions of cultured butter and normal butter is receiving further attention. Equipment for and costs of producing cultured butter have been examined.

Iron and Copper Survey in Butter.

Traces of iron and copper significantly lower the keeping quality of butter. Farm and factory equipment showing bare base metal are obvious sources of contamination. However, there are less evident sources of metallic contamination and an investigation to pinpoint such sources has been commenced. In over 500 samples of butter analysed, normal copper content has varied from 0.1 to 0.2 p.p.m. and iron content from 1.5 to 2.0 p.p.m. Butter of defective keeping quality, however, has shown up to 0.6 p.p.m. copper and 7 p.p.m. iron. Preliminary work in factories and on farms has shown a number of sources of contamination, including cream pumps, butter wash waters, farm milking machines and butter wrappers. Control measures include the use of stainless steel equipment, stainless steel cold water storage tanks, and high quality butter wrappers.

Steam Utilisation.

Fuel for steam raising in butter factories is costly. Accordingly, a steam-metering device (Plate 3) is being used to ascertain if economies in steam utilisation can be effected. It was demonstrated on cream of average quality, with one type of cream pasteuriser, that steam consumption per gal. cream treated during a period of 12 months was almost twice that being used in other countries with similar equipment. It may well be that the quality of the raw product in Queensland necessitates intensive treatment, requiring an average of 3 lb. steam per gal. cream, in order to obtain satisfactory butter quality. However, various operating techniques, aimed at achieving maximum efficiency with economy, are being tried.

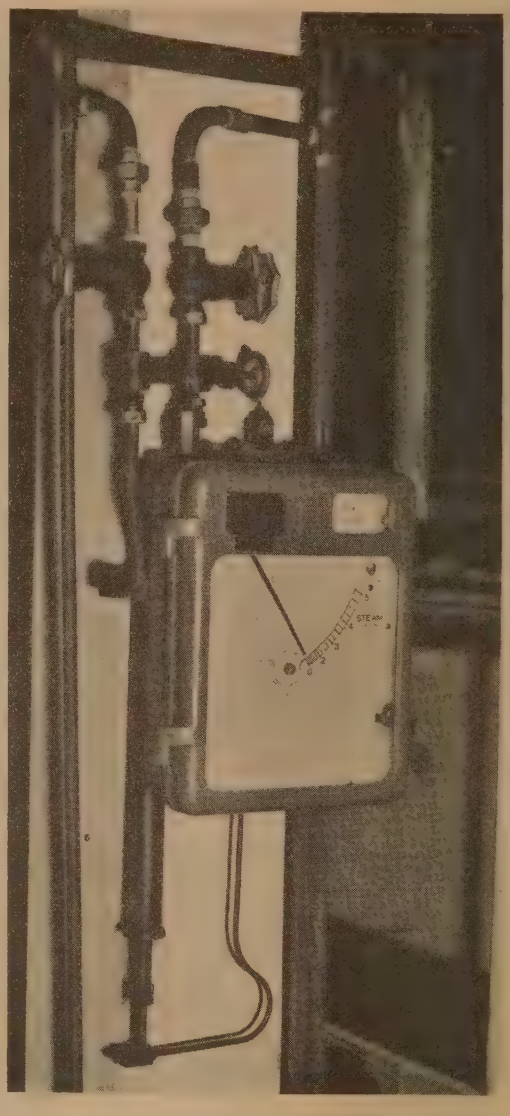


Plate 3.—Steam Meter in a Butter Factory.

Compositional Quality of Milk.

Wide seasonal variations in the compositional quality of milk, typified by fluctuating fat and solids-not-fat percentages, present a serious problem to the dairying industry and trials have continued with a view to determining methods whereby variations may be reduced. During the past year, drought accentuated the variability and many farm and bulk milk supplies were sub-standard. The opportunity was taken to determine the relationship between the nutritive value and type of feed consumed by cows and the composition of milk.

In this regard, 13 farmers co-operated in feeding trials during and after drought conditions. All 13 co-operators supplied sub-standard milk during the six months of the drought. Each herd was on a low plane of nutrition. It was shown that while the interval between the morning and afternoon milkings noticeably affected the fat percentage, the solids-not-fat percentage remained almost constant. However, when good pastures became available following plentiful rains, the compositional quality of milk supplies from all farms rapidly returned to normal, with an average rise of 0.5 in the fat percentage and 0.6 in the solids-not-fat

percentage. It was also apparent that with cows on a good plane of nutrition the milking interval did not appreciably affect the fat percentage or the solids-not-fat percentage. Apparently, a low nutritional status of dairy herds is the chief cause of the decline in compositional quality of milk in Queensland during the normally dry late winter and early spring months.

Eight farmers co-operated in further experimental work. On one farm, using a pair of identical twins, a good roughage ration was fed to one twin, while the other was fed concentrates with some roughage. Generally, the compositional quality of the milk and the milk yield were similar in both animals. However, the fat percentage appeared to be largely affected by the intake and quality of the roughage consumed, while the protein content of milk, the major factor in the solids-not-fat percentage, appeared to be increased by raising the intake level of protein (as grazed lucerne, young oats and wheat, or concentrates) and providing a mineral supplement. On another farm, addition of good roughage to the rations fed to selected cows raised the fat content by 1 per cent. without any effect on the solids-not-fat percentage. However, the inclusion of a concentrate containing 18 per cent. protein in the ration raised the solids-not-fat percentage by almost 1 per cent. from cows in a herd which frequently produced milk of sub-standard composition.

On five farms where lucerne, green panic, prairie and Rhodes grass pasture mixtures have been established, without irrigation, the compositional quality of cheese-milk has been improved. On a sub-coastal farm, where irrigated pastures, hay and silage are normally used to maintain a good level of feeding, the fat and solids-not-fat percentages were 3.8 and 8.6 respectively. However, on removal of the herd from the irrigated pastures, the solids-not-fat percentage of the milk declined to 8.2 and the fat percentage declined slightly. Upon return to the usual feeding practices, both the fat and solids-not-fat percentages were restored to the original levels.

Overseas work suggests that an abnormally low concentration of acetic acid in the rumen may depress the fat percentage of milk, especially of cows on a low roughage intake. Accordingly, sodium acetate and acetic acid have been tried in rations fed to some cows. While promising results have been obtained, further confirmation is necessary.

Recombined Milk.

This product offers promise as an additional outlet for butterfat and skim-milk powder to districts and countries where fresh milk is not always readily available. Previous work had shown the practicability of producing a palatable recombined milk. Some variability in flavour has occurred and efforts have been directed towards improving the flavour and uniformity of quality.

The use of imported flavour-producing starter cultures was indicated by previous work. However, cultures imported from America failed to show any significant improvement. Other types of locally produced single and mixed strains were no better. Additives including methyl sulphide, glycerol monostearate, sodium citrate, soybean lecithin, untreated sodium chloride and treated sodium chloride showed no advantage. A slight improvement was recorded with the use of 0.03 per cent. sucrose, and the raising of the non-fat solids to 10 per cent. The possible damaging effect of processing on the fat globule membrane substances suggested the use of some buttermilk powder, fresh cream or lecithin; some improvement resulted with the first two but not with lecithin. While general opinion has favoured about 12 hours' holding of the reconstituted milk solids for best flavour development, more recent work indicates that at least 30 hours is necessary for complete rehydration of the protein. This delayed absorption of moisture is noticeable with most locally produced powders. There is little doubt that the basic ingredients must be of the highest possible quality if a uniform attractive flavour is to be obtained.

Keeping Quality of Pasteurised Milk.

The investigational work on the keeping quality of pasteurised milk, commenced during the previous year, was continued. Samples have been stored over a range of temperatures for periods of time varying from 15 to 24 hours, and the results obtained have enabled the storage deterioration pattern of each milk to be studied. It would now appear possible to evolve a technique of testing which is suitable to a wide range of climatic conditions. The results obtained have also permitted a close examination of the standard for the test so far as it relates to the conditions of storage and deterioration trends.

Thermoduric Organisms in Milk.

Some difficulty is experienced in consistently producing pasteurised milk which conforms to a bacterial standard of not more than 50,000 per ml. This is due to certain organisms originally present in the raw milk which resist the pasteurisation temperature. The retention in the amended Food and Drug Regulations of the plate count standard of 50,000 organisms per ml. for pasteurised milk has increased the importance of thermoduric bacteria. Some recent investigational work has indicated that these organisms, which are usually considered inert, do play a part in determining the keeping quality of pasteurised milk. The added emphasis which has had to be placed on these organisms has raised the need for some investigation of their detection, incidence and significance. Methods of detection and estimation are under examination.

In an endeavour to relieve the burden of testing by this Branch, a trial of the practicability of the factories themselves carrying out tests for thermoduric organisms was made. After initial instruction, the factory staff successfully carried on the testing work. The success of the work can be gauged by the fact that the thermoduric counts of bulk milk from the factory concerned have been reduced quite quickly from a very high order to levels considered to be satisfactory.

Some attention has been paid to the part played by road tankers in contributing to high thermoduric counts and to this end special equipment for thoroughly rinsing the tanker surface has been devised. The equipment is also adaptable for the more effective sterilizing of tanker surfaces by jetting with a new quaternary ammonium compound. One paper has been prepared on this work and another is in the course of preparation.

Cryophilic Organisms in Milk.

Work on the study of cryophilic (low temperature) bacteria in market milk supplies was commenced. This work has taken the form of a survey of the degree of contamination by cryophilic types in bulk milk supplies, together with a study of the part played by these organisms in milk quality deterioration. It has some practical significance in that from time to time protracted storage of raw milk at depots may be responsible for off-flavours developing. It would appear that the incidence of these bacterial types is quite high, that they increase steeply on storage of bulk raw milk, and that a cryophilic count may serve as a useful indication of potential deterioration.

Clarification of Milk.

The effect of clarification on raw milk quality is being investigated. The results so far indicate that, as judged by the total and thermoduric bacterial counts, there is an improvement in the bacteriological quality of clarified milk. Although much sludge is removed from the milk, there is no evidence of any significant effect on the fat or solids-not-fat content.

Milk Proteins and Sugars.

Electrophoretic investigations of blood plasma proteins and the proteins and sugars of milk and cheese are proceeding. It has been shown that a poor level of feeding affects the gamma-globulin content of blood plasma in the same way as does mastitis infection. In the case of mastitis or malnutrition, there is a marked increase in the percentage of the gamma-globulin fraction, while in well-fed, healthy cows the percentage of globulins tends to equal the percentage of albumins.

With normal cow's milk, the beta-lactoglobulins have further demonstrated the heterogeneity of the protein fraction. Some cows show either beta 1 or beta 2 fractions or both. The development of a new type of electrophoretic strip will speed up this work. With the aid of paper chromatography it has also been possible to resolve mixtures of reducing sugars in milk and cheese.

The application of these techniques is proving helpful in determining the more complex constituents of dairy products and their significance.

Moisture Content and Quality of Cheese.

This project is designed to examine the effect of the moisture content of cheese on its quality. A total of 174 vats of cheese has now been made and the results are being collated. A preliminary examination indicates that the work has shown the way for further improvement in cheese quality. In addition, the results are being examined in a study of the economics of the process, based on present cheese price differentials.

A comparison of the experimental cheese with a lowered moisture content and the cheese with a normal moisture content is given in Table 1.

TABLE 1.

MOISTURE CONTENT OF CHEESE AND GRADE.

Type of Cheese.	Number of Vats Analysed.	Average Moisture.	Average M.F.F.S.	Number of Vats Graded.	Average Grade Points Scored.				
					Normal Grading.	Flavour	Body.	Texture.	Colour.
		Per cent.	Per cent.		Total Points.	(Max. 50 Points).	(By special system; max. 5 points for each).		
Normal	55	36·25	54·07	70	90·30	40·92	3·87	3·28	4·03
Low Moisture ..	56	34·86	52·27	70	91·05	41·49	4·24	3·42	4·35

M.F.F.S. = Moisture in the fat-free substance.

The results show that the cheese with the lower moisture content received a higher grade score for all properties considered. They also support the theory that the optimum moisture content of cheese varies with the composition of the milk. It also appears that the ratio of moisture to solids-not-fat in cheddar cheese is more closely related to quality than either fat or moisture alone. It would seem that the optimum moisture content of cheese for the attaining of highest grade is within the range 52.5–53 per cent. when expressed as percentage of moisture in the fat-free substance.

Inhibitory Factors in Cheese-Milk.

Inhibitory factors other than bacteriophage occur in cheese-milk and restrict the development of some starter cultures. Work on these factors has been furthered during the year. The effect of inhibition is noticeable not only in acid production but also in bacterial multiplication; it occurs in pasteurised milk but not in sterilized milk. Milk has been fractionated by different means into whey, curd, cream and skim-milk and it would appear that the inhibitory principle is concentrated in the whey.

Following separation of milk into cream and skim-milk fractions, susceptible strains of starters displayed improved acidity production in both cream and skim-milk. Various means of controlling and identifying the inhibitory principle have been tried; interpretations are not yet finalised. One paper on the work has already been published and another is being prepared.

Packaged Cheese Problems.

The improved packaging of cheese in plastic-like materials continues to be favoured by consumers. New types of plastic materials are being continually sought by the trade.

A number of problems arising in packaged cheese—e.g., gassy, digested and mouldy cheese—are under investigation. Some packaged cheese have developed gas and fluid after 6–8 months' maturing. An incubation test for anaerobic spore-forming organisms has consistently given positive results, and the defect also appears to be associated with cheese of above-average pH. Periodic mould infestation of some packaged cheese presented a problem. However, the approval of sorbic acid as an antimycotic for use on cheese wrappers may prove helpful in reducing this problem and trials are being arranged.

Table Cream.

The development of the table cream market offers a valuable local outlet for butterfat, and attention has been given to raising the standard of quality in order to encourage increased consumption. In association with the Health Department, processing, chemical and bacteriological standards aimed at improving keeping quality were determined. Trials to determine the effect of fat content on whipping of cream were carried out, and good whipping ability was shown in the range 30–40 per cent. fat. A reconstituted cream has also been produced.

Detergents and Chemical Sterilants.

With a view to determining better methods of cleaning milking machines, three types of alkali-acid detergents in combination with wetting agents, used with and without recirculation, were tested on 22 farms.

Daily use of sodium metasilicate and wetting agent, and a dilute hydrochloric acid solution once weekly, resulted in the bacterial content of the milk in the can at the point of production being less than 10,000 per ml. on 40 per cent. of occasions and less than 30,000 on 90 per cent. of occasions; no count was greater than 50,000 colonies per ml.

Use of sodium metasilicate and wetting agent for six days and phosphoric acid on the seventh day gave corresponding counts of 30 per cent. less than 10,000; 57 per cent. less than 30,000; 84 per cent. less than 100,000; and 92 per cent. less than 300,000 organisms per ml..

The alkali-citric acid cleaning technique showed 41 per cent. of the milk-in-can samples to be less than 10,000; 77 per cent. were less than 30,000, 93 per cent. less than 100,000, and 98 per cent. less than 300,000 colonies per ml. While all mixtures tested gave reasonably good results, the sodium metasilicate–hydrochloric acid technique proved efficient and cheap. When used as directed, the inclusion of hydrochloric acid did not cause any corrosion of equipment over a period of 12 months.

A new quaternary ammonium chemical sterilant has proved promising in laboratory and field trials when compared with hypochlorites. The inclusion of this quaternary in a detergent mixture has given good results as a combined detergent-sanitiser.

Dairy Rubberware.

The advantage of a mixture of synthetic and natural rubber in improving the quality of dairy rubberware was demonstrated in field trials. The results of these investigations are now being assessed in the laboratory with equipment which will enable length of life, rate of milking, stretch, degree of fat absorption, and

cracking and other faults to be examined under uniform conditions. A paper on dairy rubberware and its care has been prepared.

Farm Refrigeration.

In the warm climatic conditions of Queensland, farm refrigeration offers the best method of rapidly improving the quality of dairy produce. However, the refrigerators available are costly and trials have been made with a

Plate 4.—An In-the-tank Refrigeration Unit with Farm-built Concrete Cabinet.

cheaper type of drop-in refrigeration unit in a farm-built concrete cabinet (Plate 4) for the cooling of milk or cream. The farm-built cabinet proved to be as efficient during a 12 months' trial as the costlier completely prefabricated unit. The capital cost is estimated to be about £200 per unit and operating cost approximately 2d. per gal. of cream, which compares favourably with stock-built types of refrigeration units.

Solar Water Heater.

The experimental solar water heater mentioned in last year's report was installed on a dairy farm. Several modifications in construction of the water storage unit and increased absorber surface have been made with a view to greater efficiency. While satisfactory water temperatures for cleaning purposes can be obtained by solar energy alone, electricity is necessary to heat the water to scalding temperature. The cost of operation is being assessed and ways and means of reducing capital costs are under consideration.

Other Investigations.

Investigations are continuing into the causes of high titratable acidities in some freshly-drawn milks, white particles in pasteurised milk, and detection of coliform bacteria by means of new differentiating bacteriological media.

LABORATORY QUALITY CONTROL SCHEMES.

Quality control schemes for dairy products were continued during the year. Where warranted, the sampling rate was increased to meet changing circumstances.

Market Milk.

Very close control of milk quality was maintained in the metropolitan area, where the milk quality control work is carried out on behalf of the Brisbane Milk Board. Similar control was applied in country areas served by the regional laboratories at Toowoomba, Murgon and Malanda. In country areas not so served, it was not practicable to keep up the same sampling frequency and weekly samples forwarded by air have been more common. All milk-receiving depots throughout the State regularly sample and test raw milk supplies for methylene blue reduction times and butterfat content.

The Branch, on behalf of Commonwealth authorities, has tested milk samples submitted by armed service establishments and immigration depots.

Details of the samples examined in connection with the control of market milk and table cream are summarised in Table 2.

TABLE 2.

SUMMARY OF MARKET MILK LABORATORY TESTS.

	1956–57.	1957–58.
Bottled pasteurised milk—		
Plate counts	2,272	1,783
Greater than 100,000 per ml.	..	1,345
Coliform tests (10 ml. and 1 ml. levels)	4,138	3,348
Percentage positive in 1 ml.	20·1	16·5
Phosphatase tests—		
Number	1,952	1,589
Percentage positive	0·16	0·31
Keeping quality tests—		
Number	856	685
Percentage of failures	3·8	2·4
Fat tests—		
Number	2,320	1,811
Average percentage	3·80	3·88
Solids-not-fat tests—		
Number	2,180	1,509
Average percentage	8·56	8·56
Freezing Point tests	..	630
Factory surveys	66	67
Raw milks from country depots—		
Methylene blue tests	5,679	7,181
Fat tests	5,680	7,120
Bulk tanker samples tested in laboratory		
Methylene blue tests	672	467
Fat tests	700	460
Raw milk produced for vendors—		
Methylene blue tests	507	359
Fat tests	512	359
Thermoduric counts on raw milk	3,190	12,040
Microscopic examinations	4,440	4,771
Cream—		
Bottled pasteurised cream—		
Plate counts	372	357
Greater than 100,000 per ml.	..	198
Coliform tests—		
Number	375	373
Percentage positive in 1 ml.	73·2	56·8
Phosphatase tests—		
Number	378	363
Percentage positive	88·3	7·4
Fat tests—		
Number	393	370
Average percentage	37·3	37·45
Total number of tests in Branch laboratories	36,616	44,945

In addition, tests on raw milk made by factories included the following:—

	1956–57.	1957–58.
Methylene blue tests—		
Number	347,562	372,265
Percentage below 4 hours	4·9	4·7
Fat tests—		
Number	109,014	107,746
Percentage below 3·3	3·1	7·2

Raw Milk Quality.—There was an increase in the number of methylene blue tests carried out at pasteurisation plants and country chilling factories. At the same time, there was a slight reduction in the percentage of such milks which failed the 4 hours advisory standard (4.7 per cent., compared with 4.9). This fall in the percentage of milks which failed to pass the test is gratifying and indicates that the bulk of the milk supplied from farms is of satisfactory bacteriological quality so far as this test is concerned. Smears of milks which failed the methylene blue test were made in the factories and microscopic examinations were carried out in the Branch laboratory to discern the probable causes.

Due to drought conditions, many herds were grossly underfed and consequently a greater number of milks failed the 3.3 per cent. standard for fat than during the previous year.

Bulk milks brought into Brisbane by tanker and samples from producer-vendors of unpasteurised milk were also examined.

Thermoduric Bacteria.—It has become quite clear during recent years that the application of dye-reduction tests for the control and improvement of raw milk

quality has not been entirely satisfactory. The bacterial counts of bottled pasteurised milk, which comprise mostly thermoduric types, have become high, despite the constant improvement in the methylene blue test results of raw milk supplied. There have been occasions when the flavour and the keeping quality of the pasteurised product have not been up to the standards desired. In consequence, the control of thermoduric organisms (Plate 5)

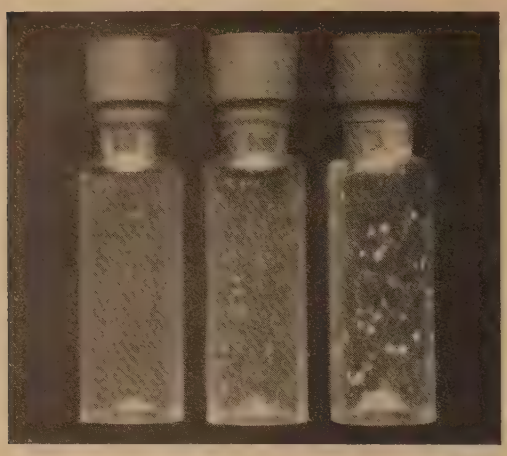


Plate 5.—Roll Tubes, Showing Thermoduric Bacteria.

in raw milk supplies has been intensified and the numbers of thermoduric counts performed has increased threefold. In the metropolitan area, 46 per cent. of samples had counts below 30,000 per ml., which can be regarded as satisfactory in milk used for the pasteurised trade. Half of the remaining 54 per cent. were classed as poor, with counts between 30,000 and 100,000 per ml., while the other half were most unsatisfactory, having counts in excess of 100,000 per ml. It is encouraging to note a significant fall in the thermoduric counts of bulk milk supplies since the testing was commenced and advisory help given farmers.

There is no doubt that the work on high thermoduric counts must be continued and the thermoduric test must be considered as an adjunct to the methylene blue test.

Pasteurised Milk Quality.—Pasteurised milk quality was well maintained. Almost 100 per cent. of samples gave negative phosphatase tests, indicating satisfactory pasteurisation, and more than 97 per cent. passed the official keeping quality test. There was also a gradual but significant lowering in the total bacterial counts and an appreciable reduction in the percentage of milks giving a positive coliform test in 1 ml., indicating that post-pasteurisation contamination is being reduced. The compositional quality of pasteurised milk was well maintained, the fat averaging 3.88 per cent. and non-fat solids 8.56 per cent.

Pasteurised Cream Quality.—A new regulation under the Food and Drug Regulations which prescribes the processing and bacteriological standards for cream has facilitated the improvement in quality. There was a very great reduction in the incidence of positive phosphatase tests (7.4 per cent., compared with 88.3 per cent. during the previous year), in total bacterial counts and in the number of creams showing positive coliform tests. The average fat content was 37.4 per cent.

Farm Milk Quality.—At the request of the Brisbane Milk Board a survey was conducted with a view to ascertaining the cause of the high incidence of low fat and solids-not-fat percentages during the months October, 1957, to January, 1958. It was clearly shown that insufficient green feed and poor nutritive value of pastures were mainly responsible.

Freezing Point Determinations.—A total of 1,768 raw and pasteurised milks was subjected to the freezing-point test. Eight cases of grossly adulterated milk were detected. However, the high degree of variability in freezing point and high ash percentages show that greater care must be exercised in both production and processing to avoid "accidental adulteration" with water, detergents and sterilizing solutions.

Cheese.

The cheese industry continued to receive assistance in the way of distribution of starter cultures, analyses of cheese samples and factory technical surveys. As much use as possible was also made of schools, conferences, lectures and demonstrations to extend technical aid to this section of the industry.

Quality Control at Factories.—A number of associations expressed a desire to undertake some laboratory testing procedures for the control of cheese quality and composition at their factories. Consequently, advice on setting up and equipping small factory laboratories, as at Pittsworth, for conducting simple tests for analysis of cheese, milk and cheese quality was given.

Cheese Starters.—A total of 941 starter cultures, of which 208 were freeze-dried, was distributed to factories. Starter failures due to bacteriophage showed a decline due to the application of improved culturing techniques. At one factory which experienced starter failures due to bacteriophage, a phage-resistant medium was used to culture the starters and the incidence of bacteriophage was reduced. Intermittent use of PRM under such circumstances may offer possibilities.

Coliform Contamination of Cheese-Milk.—The incidence of gassy cheese was found to be due to contamination by coliform bacteria after pasteurisation. Experimental work on the possible effects of these bacteria on the texture and flavour of cheese is proceeding.

Cheese Composition.—Of 60 samples of cheddar cheese analysed, only two had in excess of 40 per cent. moisture, but 11 had a fat content of less than 50 per cent. of the moisture-free-substance. Almost all of the low-fat cheese occurred during the month of September, when there was a high incidence of low fat milk. The average composition was:—moisture, 37.6 per cent.; moisture in the fat-free substance, 55.2 per cent.; fat, 31.9 per cent.; fat in the moisture-free substance, 51.1 per cent.; salt, 1.6 per cent.; and salt in the moisture, 4.3 per cent.

Variations from 1.1 to 2.1 per cent. in salt content and from 2.6 to 5.7 per cent in moisture content were found. The average salt percentage is low and the wide range indicates a need for closer attention to this aspect of cheese manufacture.

Waxing of Cheese.—Investigations in relation to the waxing of cheese were carried out because of the need to improve the surface condition of export cheese. Attention was given to suitable types of cheese waxing blend and the temperature at which to apply the wax. The results indicate that a simple blend of one part of petroleum jelly with two parts of paraffin wax and three parts of microcrystalline wax gives a good cheese coating, and that a waxing temperature of 250 deg. F. and immersion time of five seconds give more satisfactory results than 275 deg. F. and five seconds. Large-scale commercial trials are now planned.

Cheese Packaging.—A considerable increase in the production and packaging of rindless cheese has led to a much greater demand for information and advice regarding the various processes. Displays depicting stages in packaging cheese were given. Nine factories are now packaging rindless cheese and consumer demand is growing. One cheese association increased its monthly sales of packaged rindless cheese by over 42,000 lb. in less than 12 months.

Non-Cheddar Varieties of Cheese.—Cheese other than cheddar offers room for development in this State. Two experimental batches of blue-veined cheese were made with a view to perfecting manufacturing techniques. Better eye formation in the manufacture of Edam cheese was achieved with the use of pure cultures of propionic acid bacteria. The use of specially selected milk improved the flavour, texture and body. An experimental batch of Roman cheese of good quality was made with an improved type of starter culture. In the manufacture of Gruyere cheese, it was shown that a more consistently satisfactory eye formation was attained by clarifying the milk.

Butter.

Examination of butter samples under the Butter Improvement Service was continued to provide information for both control and advisory services. A total of 22,318 tests was performed on 2,452 samples. The average chemical composition was:—moisture 15.64 per cent.; salt 1.36 per cent.; curd 0.87 per cent.; fat 82.13 per cent. The mean serum pH reading of 7.50 is somewhat lower than in the previous two years.

The average bacteriological quality index was 238 out of a possible 400. Although this shows a fair standard of hygiene, there is still room for improvement by many factories which consistently manufacture butter of poor bacteriological quality.

Microscopic examinations were carried out to check the standard of working, as judged by the size and distribution of the water droplets in the butter. In the past, this standard has been good, but this year only 63.7 per cent. of butters examined were found to be well worked or fairly well worked. Bacteriological spoilage is more likely in an underworked butter (Plate 6) and buttermakers should pay close attention to this important aspect of butter manufacture. Table 3 summarises the results.

Plate 6.—An Underworked Butter Under the Microscope.

TABLE 3.

RESULTS OF MICROSCOPIC EXAMINATIONS OF BUTTER.

——	Well Worked.	Fairly Well Worked.	Rather Underworked.	Underworked.	Very Underworked.	Very Underworked.
Number of Tests	986	329	389	285	73	2
Percentage of Total	47·8	15·9	18·9	13·8	3·5	0·1

A total of 1,889 butters was examined for extraneous matter with results as follows:—

——	Number of Tests.	Percentage of Total.
Clean	463	24·5
Fairly Clean	1,219	64·6
Dirty	193	10·2
Very Dirty	14	0·7

These figures are very similar to those of the previous year, and show that 89 per cent. reached a satisfactory standard. However, the number of butters (totalling 11 per cent.) which were classified as "dirty" or "very dirty" is still rather high and emphasises the necessity for the efficient filtration of cream.

Packaging of Butter.—Keeping quality trials showed that greater deterioration of quality in both bulk and pat butter occurs at the surface than in the interior. Butters patted after storage were found to be lower in grade than the bulk butter itself after storage. As the outside skin of the butter was inferior in quality, the quality and type of parchment used was suspected. Consequently, a storage experiment was performed to check any differences between the same butters wrapped in different quality parchments.

After five months' storage the portions from the centres of the boxes retained their original quality but the flavour of the outside skin of butter wrapped in heavier parchment was superior to that of butter wrapped in lighter parchment.

In pat butter, severe oxidation, surface drying out and discolouration occurred on the outside. Trials with heavier parchments reduced these defects. However, the use of aluminium parchfoil eliminated the surface defects and maintained the quality of the butter.

Miscellaneous.

Water Supplies.—The seasonal conditions affected the quality of water supplies used in the dairying industry. Over 300 samples were analysed in a survey of the suitability of waters for farm and factory use. Many were hard and corrosive and required treatment. Some factory waters showed the presence of extraneous matter and the need for filtration before use in butter-washing. Already the survey shows the need for more efficient treatment of many supplies.

While chlorination is helpful in improving the bacteriological quality of waters, it causes corrosion of piping in reticulation systems. Consequently, a new quaternary ammonium compound and a new form of sterilization by ultro-violet light are being tried.

Dairy Glassware.—Of 9,435 pieces of glassware submitted for testing, the percentage condemned was 6.5, compared with 5.9 in the previous year.

STATISTICS, PUBLICATIONS, ETC.

Table 4 summarises some further activities of the Branch.

TABLE 4.

SUMMARY OF SOME BRANCH ACTIVITIES.

——	No. of Samples.	No. of Tests.
Butter improvement service ..	3,089	22,955
Laboratory quality control of market milk	11,677	44,945
Analytical	6,329	17,712
Cheese starter cultures distributed	941	..
Dairy glassware tested	9,435	..

	No.
Factory surveys	120
Farm trials	231
Technical and advisory articles	13
Radio talks	20
Schools, demonstrations, etc.	27
Addresses, lectures, etc.	21

Officers have contributed to Technical Service Notes prepared for the guidance of Divisional officers.

Two officers of the Branch made interstate visits on technical matters. Several Colombo Plan Fellows and two technologists from dairy associations spent some time in the Branch in order to acquire information on laboratory control schemes.

DIVISION OF MARKETING: BRANCH REPORTS.

MARKETING BRANCH.

Mr. H. S. Hunter, Director of Marketing.

MARKETING.

World industrial production continued to grow in the first half of 1957 at a much slower rate than in 1956, and it seems that expansion came to a halt in the second half of 1957. The trend of world trade has been similar to that of industrial production.

Dry conditions throughout the year resulted in reduced production of many export commodities. These adverse conditions, coupled with price falls for many of Australia's exports, resulted in a deterioration in the balance of payments position.

The value of exports for the year was £821 m., £172 m. less than in the previous year. The rate of imports has increased and their value was £73 m. greater, thus increasing the adverse swing in the balance of payments. The excess of exports over imports, which at end of June, 1957, amounted to £274 m., at the end of June, 1958, was only £28 m.

Price falls on the export market, together with other difficulties referred to below, point the need for primary industry to devote more attention to the local market. Particularly is this the case with dairy produce and eggs. Consumption of butter in Australia, for example, has not kept pace with the increase in population. Consumption per head in 1938 was 32.6 lb.; in 1956-57 it had in fact fallen to 27.5 lb. Although Australians rank high in the *per capita* consumption of meat, consumption of beef and veal in Australia, which stood at 144 lb. in 1938, is now only 127 lb.

Plate 1 compares Australian *per capita* consumption of several commodities, pre-war and in 1951-52 and 1956-57.

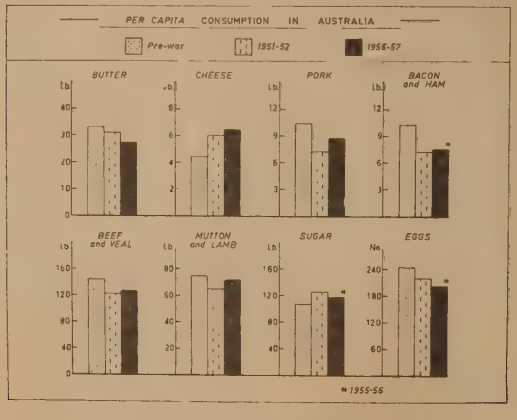


Plate 1.—Changes in Per Capita Consumption of Various Commodities.

It will be seen from the above chart that cheese is one of the few commodities of which the *per capita* consumption has increased since pre-war. Until 1955-56 the consumption of cheese tended to decline but there was a pronounced rise in 1956-57. However, it is worthy of note that insufficient effort has as yet been made to produce those exotic types of cheeses for which there has been an increasing demand since the war.

Any increase in the consumption of dairy products in all forms, including liquid and dried milks, would tend to reduce the uneconomic exportable surplus of butter.

United Kingdom Market.

Traditionally the best customer for our agricultural products, the United Kingdom now poses many problems for our export industries. This market has deteriorated in post-war years for several reasons.

The main cause is undoubtedly the impetus given to increased home production by large Government subsidies under the agricultural legislation. In 1956-57 these amounted to £240m., and in 1957-58 to £290m. They are to be reduced by £19 m. for 1958-59. Plate 2 shows

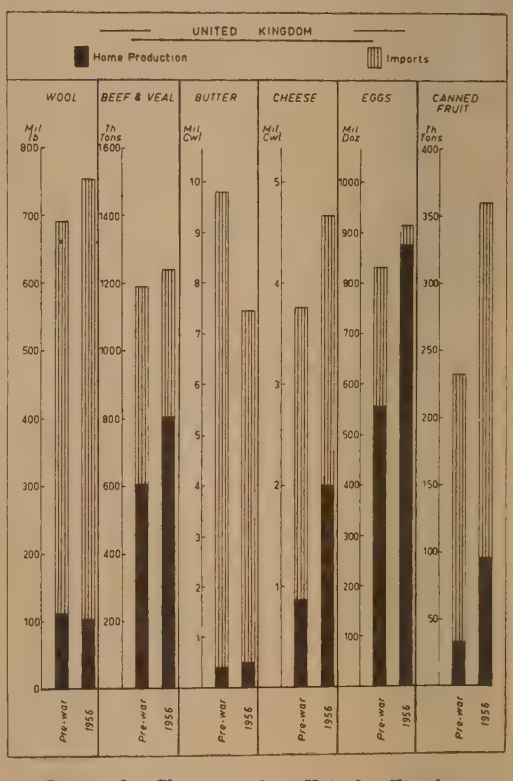


Plate 2.—Changes in United Kingdom Production and Imports of Various Commodities.

how the United Kingdom has become more self-sufficient and less dependent on imported farm products. Agricultural output in the United Kingdom in 1957-58 is estimated by the United Kingdom authorities at 63 per cent. above pre-war.

In the case of eggs, British farmers now produce 95 per cent. of United Kingdom requirements, compared with 17 per cent. pre-war. Comparative figures for 1957 and pre-war in the case of other products are as follows:—Butter, 9 per cent. and 4 per cent.; cheese 48 per cent. and 23 per cent.; meat 64 per cent. and 50 per cent.

The smaller market for imported produce has led to more severe competition for that part of the market, and, in the case of dairy products, also to increased supplies leading to price reductions. Further marketing problems on this important market arise from the policy of the United States of America in disposing of surplus farm products under Public Law 480, whereby surpluses are exported and paid for in the currency of the importing country.

As a result of these market conditions Australian exporters have had to look for markets elsewhere, with various degrees of success.

Local Markets.

In stressing the need for the export industries to develop more interest in the local market, attention must also be drawn to those commodities the demand for which is at present largely met by imports. In particular, reference is made to tobacco leaf, cotton, peanuts and oil-bearing seeds.

To illustrate the extent to which production of those commodities could be expanded, it is of interest to note that of an annual tobacco consumption in Australia of about 50m. lb., only about 12m. lb. is Australian leaf.

The problems peculiar to these industries are those of stable and satisfactory returns relative to the returns from alternative crops. It is by the solution of these problems that production may be expanded to meet home requirements.

A good deal of attention is being given to the establishment of the tobacco leaf and cotton industries on a sound technological basis so as to give the consumer the type of product required on the Australian market. The Tobacco Industry Trust fund is an example of grower, manufacturer and Government co-operation towards this end.

Pastoral.

It is estimated that the Australian wool clip for 1957-58 was 1,426 m. lb. greasy, or 9 per cent. less than in the previous season. This fall in production followed successive increases over the three previous years. In March 1958 prices, after declining to their lowest level for eight years, showed slight recovery for end-of-season sales. The average Australian price for greasy wool during the 1957-58 season was 62.27d. per lb., compared with 79.66d. per lb. in the previous season. Sales for the season totalled 4,374,694 bales, a fall of 511,867 bales from last year's level. Queensland sales were 705,657 bales, compared with 798,906 bales in the previous year. The average price for greasy wool realised at these sales was 65.07d. per lb., compared with 84.09d. per lb. in 1956-57.

Australian exports of 1,280.3 m. lb. valued at £373.6 m. represented declines from 1956-57 of 9 per cent. and 22 per cent. greasy equiv. respectively. The lower prices are regarded as an effect on consumer demand of the economic uncertainty at present evident overseas.

Australian meat production achieved a new peak for the 12 months ended December 1957, when output reached 1,273,000 tons, but continuance of drought conditions into 1958 reduced the turn-off of cattle for slaughter, particularly in Queensland. For the 12 months ended June 30, 1958, production of beef and veal in Queensland was 14 per cent. lower than in the previous 12 months. Frozen beef prices on Smithfield Market at the commencement of the season were below those operating 12 months earlier, but since January there has been an upward movement.

The 15-year meat agreement with the United Kingdom provides an assured market for Australian meat as there is no restriction on the quantity which may be shipped. Guaranteed prices for beef, fixed at 95 per cent. of the 1953-54 contract prices, will operate until Sept. 30, 1958, after which a 5 per cent. reduction, as agreed at the 1955 review of prices, will apply. Prices negotiated for mutton will remain at the 1954-55 level until Oct. 1, 1958.

During June 1958 talks between Australian and United Kingdom authorities were held to review minimum prices for the 3-year period 1961-1964 with respect to beef and the three years 1958-1961 with respect to mutton and lamb.

An encouraging feature is the development of chilled beef shipping services to the United Kingdom by regular monthly sailings *via* Torres Strait, which will enable meat to be landed in the United Kingdom within 28 days of leaving Queensland ports.

Dairy Products.

But for the protection given the dairy industry by the Dairying Industry Stabilisation Plan, the year 1957-58 would have been a disastrous one. With production of butter and cheese down on account of drought conditions by 9 per cent. and 22 per cent. respectively over all Australia (21 per cent. and 28 per cent. in Queensland), farmers' incomes from this cause alone were decreased considerably. Added to this, prices for butter on the United Kingdom market collapsed, while cheese prices were also very unsatisfactory.

Although prices for Australian butter on the United Kingdom market recovered from the low level of 247s. per cwt. which prevailed early in 1957 to 319s. per cwt. by the end of the following June, prices have since progressively declined to the level of the early post-war years. The price at mid-May was 205s. per cwt., but there was a slight rise to 214s. per cwt. at the end of June as the result of a strike in the London Docks.

The fall in price is the result of accumulated stocks in cold store in the United Kingdom following abnormal imports from Eire, Finland, Poland and Sweden. United Kingdom home production has also increased both from higher cow numbers and from greater production per cow following generally favourable seasonal conditions. With the extremely good season experienced in New Zealand, shipments from that country in 1958 should be higher than in 1957.

Plate 3 shows the fall in price of Australian butter sold in the United Kingdom since the termination of the long-term contract in June 1955. The extent to which the industry has been buttressed by subsidies paid under the Dairying Industry Stabilisation Plan is clear.

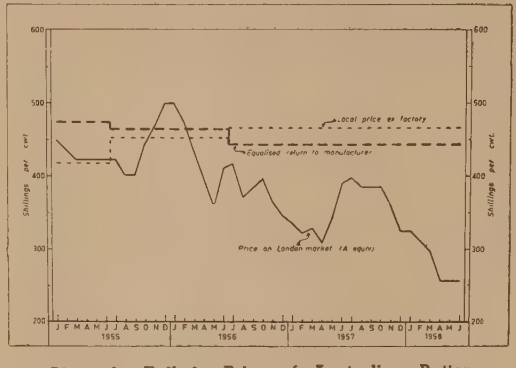

600
500
400
300
200
Shillings per cwt
Local price ex factory
Equalised return to manufacturer
Price on London market (A equiv)
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
1955
1956
1957
1958

Plate 3.—Fall in Price of Australian Butter in the United Kingdom.

United Kingdom cheese production reached a record level in 1957 and accounted for 48 per cent. of available supplies. The price prevailing for Australian cheese in April, 148s. per cwt., was 60s. per cwt. lower than 12 months previously.

Eggs.

Returns to egg producers have also been adversely affected by the position in the United Kingdom. Stimulated by subsidies which in 1957-58 are expected to exceed £48m., United Kingdom producers now provide 95 per cent. of United Kingdom requirements. Consequently other markets have had to be sought. During 1957-58 only 18 per cent. of exports in shell were sold in the United Kingdom, while 48 per cent. were sold to Western Germany. New markets have also been explored in Southern European countries and Venezuela.

Net payments by The South Queensland Egg Marketing Board to its suppliers averaged 5.38d. per doz. higher in 1957-58 than in the previous season. This resulted directly from the decline in commercial production from 8.5 m. doz. to 7.5 m. doz., which meant that a lower proportion of the intake had to be disposed of on the less remunerative export market. Actual export of eggs in shell from the South Queensland Egg Marketing Board in 1957-58 was 18,608 cases (30 doz. each), compared with 25,001 cases in 1956-57, while export of liquid whole egg totalled only 13,332 tins (28 lb.) in 1957-58, a decrease of 39,017 tins on the previous year.

In Central Queensland, however, the Board's intake continues to increase. Receivals for 1957-58 amounted to 390,276 doz.

The decline in production is directly attributable to the higher cost of feed occasioned by cumulative drought conditions. It has been calculated that, spread over 1957-58, feed costs were over 4d. per doz. eggs higher than the average of the previous 12 months.

The increase in price on the local market has to a large extent offset the increased cost of feed, tending to maintain the price/feed cost ratio at the 1956-57 level. The industry has thus not yet recovered the 1955-56 position. Future prospects are dependent on grain prices and export returns and are not bright. Although new markets have been explored, these cannot be regarded as satisfactory at present price/feed cost ratios.

Sugar.

The international market last year was marked by high prices and wide fluctuations in daily quotations. From Jan. 25 to Nov. 18, 1957, international quotas were suspended. Since then prices have fallen below 4.00 cents per lb. and quotas have been reimposed. The suspension of quotas enabled Australia to export 767,832 tons of sugar in 1957, 148,000 tons in excess of the quota of 619,177 tons. For 1958, Australia's basic quota is 631,962 tons, which may be increased by shortfalls in other Commonwealth countries.

The International Agreement expires at the end of 1958. Talks under the aegis of the United Nations are to take place at Geneva in September, for the formulation of a new agreement.

The negotiated price for 1958 under the Commonwealth Sugar Agreement was fixed at £43 16s. 8d. stg. per ton, an increase of £1 13s. 4d. stg. per ton over the 1957 price. The Agreement has also been extended for a further year until the end of 1965 .

The overall price for the 1957 season for Home Consumption, Surplus and Excess sugar was £49 5s. per ton, compared with £46 10s. 6d. for the 1956 season. Current export prices have fallen and it is likely this will result in a fall in the average price for the 1958 season.

The sugar industry is fortunate in the protection it receives on the United Kingdom market from the Commonwealth Sugar Agreement. The industry itself, however, is continually striving to increase its efficiency. Bulk handling is already functioning smoothly at Mackay and further similar facilities, at Bundaberg and Lucinda, are expected to be operating in 1958.

The local market too is receiving attention. There has been an encouraging expansion of the trade in liquid sugar delivered by tanker. A new development being planned is expansion of the packaging of refined sugar for the retail trade.

Fruit.

Pineapple production in 1958 is expected to be slightly in excess of that in 1957, but export prospects show no improvement on last year. Competition from other Commonwealth countries remains very keen and Queensland's canned pineapple prices are being undercut by both Malaya and South Africa. The position has been worsened by the United Kingdom Government issuing import licences for £125,000 sterling for pineapple imports from the U.S.A. under Public Law 480, in spite of strong protests made by the Australian authorities. The New Zealand market has received a set-back from the import restrictions imposed by the New Zealand Government. In Canada the dominating factor is price.

A notable feature of the horticultural industries in 1957 was the record plantings of strawberries in southern Queensland. This was partially due to the stimulus of a minimum price of 2s. 3d. per lb. for canning quality guaranteed by the Northgate cannery, compared with 2s. per lb. in the previous year.

Apple exports to the United Kingdom are usually made *via* Sydney, because of lack of shipping space. During the period Jan. 1 to May 31, 1958, space became available and two shipments totalling 16,976 cases were made direct from Brisbane. The apples caught the early market in the United Kingdom; they were well received and good prices were realised. Totals of 3,238 cases of apples and 300 cases of pears were also shipped direct to Far Eastern countries.

Grain and Seed Crops.

Because of a very short wheat crop of only 97m. bushels, Australia has not been greatly affected by world wheat market difficulties; exports have in fact had to be limited. This was against a world background of heavy stocks and intense competitive selling.

In Queensland, for the second successive year, the wheat crop failed to produce sufficient grain to meet the State's normal requirements and all available supplies of Queensland wheat were reserved for flour milling. Extremely dry conditions in the main winter grain areas resulted in lower yields, while many crops were abandoned. The wheat harvest was estimated at only 6,500,000 bus. and the export trade in flour was severely restricted. Some of these markets may prove difficult to recapture when supplies of milling wheat are again freely available.

The whole of this State's requirements for stock feed, as well as supplies to supplement local wheat for flour milling, were imported from southern States. Since Dec. 1 approximateely 1,500,000 bus. have been received and it is expected that another 600,000 bus. will be required before the next harvest.

In order to retain as much wheat as possible in Queensland in the face of heavy demand from drought-stricken New South Wales, the Queensland Government authorised a special drought loading of 1s. per bus. to be paid on all wheat delivered to the State Wheat Board, in addition to a special rail freight concession equivalent to 3d. per bus. overall. These additional costs are being borne entirely by Queensland consumers. Surcharges of 2s. 5¼d. per bus. on milling wheat and 2s. 5½d. per bus. on feed wheat were added to the basic Australian home consumption price of 14s. 4d. per bus. The quality premium on Queensland wheat for flour milling was raised from 2¾d. per bus. to 6d. per bus. for the 1957-58 crop. The selling price of feed wheat was 16s. 11½d. per bus. bulk basis from the end of January 1957. At this price the quantity of wheat sold for stock feed has fallen despite the drought, and total stock feed sales for the year may not reach 1,000,000 bus., compared with a normal figure of over 1,500,000 bus.

A large part of the feed grain demand was met by barley, the season's production of 2,500,000 bus. being held by the Barley Marketing Board for the local market. The oat crop was mostly grazed and only about 150,000 bus. was harvested from some 10,000 acres.

Supplies of grain sorghum and maize from the 1957 harvest helped to meet the feed demand for a time, but commercial supplies of these grains were largely exhausted by September 1957. Thereafter only small quantities reached the market until the main harvest of the 1958 crop began during May.

With improved seasonal conditions from March onwards there were heavy late plantings of summer grains; heavy supplies came onto the market and feed grain prices fell sharply.

Excellent planting rains were received early in June and record acreages of wheat and barley are expected for the 1958-59 season.

World markets for canary seed and White French millet were quiet. Large stocks of canary seed were carried over from the 1956-57 and 1957-58 crops. Millet stocks and also most of the small 1958 harvest were largely cleared for local stock feed during the drought.

The 1957-58 linseed crop, which suffered drought and insect damage, yielded only about 12,000 tons. It was sold to local crushers on the same basis as in previous years, i.e., £70 per ton f.o.r., Brisbane/Wallangarra.

Tobacco Leaf.

Production of tobacco leaf for the 1957-58 season was a record for the State. Deliveries to the Tobacco Leaf Marketing Board are expected to total more than 7,600,000 lb., of which 6,350,000 lb., an increase of over 40 per cent. on the previous season, will come from Queensland.

Selling has been completed in North Queensland for all but about 100 tons, and the first series of South Queensland sales has been completed. To date, 4,635,000 lb. of leaf has been sold at an average price of 137.23d. per lb., compared with the final average price for last season of 128.13d. per lb. Of the leaf offered for sale to date, 94 per cent. has been sold.

The problems arising from an auction system of marketing, particularly those relating to average prices, grades and unsold leaf, have been the subject of considerable negotiation during the year between manufacturers and the Board; they have also been dealt with by the Tobacco Advisory Committee. The views of all parties have nearly been clarified although no alternative proposals have been finalised. Grading and presentation of leaf have received attention during the last few years and the effects of this policy are now apparent in the improved general standard of leaf on sale floors. There is still room for improvement and continued effort is necessary.

Qualifying percentages for import duty rebates are announced in advance of the sale of the relevant Australian crop. The percentages to apply from July 1, 1958 to June 30, 1959, first announced as 22½ per cent. for tobacco and 14½ per cent. for cigarettes, were later amended to 16½ per cent. and 15½ per cent. respectively. The percentages for 1959-60 will be 23½ per cent. for tobacco and 22 per cent. for cigarettes.

These percentages, if met, would mean that nearly one-quarter of the tobacco used in manufacture in Australia during 1959-60 would be of Australian origin.

Cotton.

Although cotton growers have had the advantage of guaranteed returns for many years, by way of bounty from the Commonwealth Government, growers have considered the guaranteed price too low and the term of the guarantee too short to induce them to extend their plantings; it has also been difficult to attract new growers.

In March 1958 it was announced that the present guarantee of 14d. per lb., which expires in December 1958, will be continued for five years from January 1959. This has partly met the need for an expression of Government policy regarding cotton prior to the expiry of existing guarantees, as urged by the Cotton Marketing Board and this Department. A longer-term guarantee would have further stimulated the heavy investment in equipment in labour-saving machinery, a necessary prerequisite to any marked expansion in cotton growing.

A condition of the guarantee is that this Department will increase its extension services for cotton growers; in addition the Commonwealth Government will, out of the Commonwealth Extension Services Grant, provide an additional extension officer.

Australian spinners use about 80,000–90,000 bales of cotton each year, of which some 3,000 bales are home-produced. Apart from cotton goods, imports of raw cotton cost over £A6m. annually. There is thus plenty of scope for increased production of raw cotton, which would make a worthwhile contribution to improving the balance of payments situation.

Peanuts.

Peanut growers in the past season benefited from better growing conditions, and there was a substantial increase in plantings. It is estimated that the crop will be more than double last year's crop of 8,600 tons.

Artificial drying experiments are being continued by the Peanut Marketing Board in conjunction with this Department and the Department of Primary Industry. The object of these experiments is to develop a dryer and a drying technique which could be used by individual farmers. This could result in improved quality of nuts and in overcoming unfavourable weather conditions at harvest time.

The Board's grading scheme, instituted last year, is considered to have been very successful. Pooling is now on a grade basis, and growers are paid according to the grading of their deliveries. Best quality peanuts earned 10.23d. per lb., whilst the poorest quality received only 6.68d. per lb.; in both cases a final pay at a flat rate is yet to be made.

Application was made last year to the Tariff Board for increased protection on both nuts and oil. The Tariff Board has completed its report, which is expected to be tabled in the Commonwealth Parliament in the coming session.

The Peanut Marketing Board, through the Peanut Growers' Co-operative Association, has completed the erection of a new sheller building, which will improve the efficiency of working operations.

MARKETING INTELLIGENCE SERVICES.

Changes in both agronomic and economic aspects of farming, and the development of intense international competition in the marketing of rural produce, have combined to produce a situation where increasing call is being made upon the Branch's intelligence services to provide reliable data on which to base decisions relating to the production and marketing of rural produce.

During the past year more than 20,000 copies of various forecasts and reports covering the field of rural industry were distributed directly from the Branch, and pressure for further services has been mounting. Farmers are becoming more interested in commodity stocks, crop prospects and prices in other countries, and tend to look to the Branch for this type of information.

From time to time the Marketing Branch issues *Crop Reports and Forecasts* during the growing season of the various crops. The problem of forecasting the various crops has become more complex. Increased mechanisation has resulted in a propensity for substantial increase in production of some crops as prices and seasons warrant. Improving technology is constantly increasing the level of yields and modifying the effects of seasonal conditions. The diversification of planting programmes, particularly in the grain industries, is making possible the rapid switching of production resources from one crop to another.

In such a dynamic situation it is not possible to rely too heavily on methods of crop forecasting previously established by the Branch and these methods must be adjusted to meet changing conditions. With the heavy dependence of crop production on seasonal conditions, particularly rainfall, the nature of the relationship of yields to rainfall as it affects crop forecasting on a district basis warrants careful study. Attention is now being given to the building up of the necessary basic data to facilitate a closer examination of this aspect.

Changes in seasonal conditions which frequently occur after the issue of a forecast often cause a marked change in the outlook for a crop. The development of statistical controls to give a reliable and continuing measure of changes occurring between complete surveys may have to be considered. Field check procedures are receiving a good deal of attention by crop forecasters overseas, and it may well be that part of the answer to the problem of continuity lies in this direction.

Methods of sampling, processing and statistical analysis of data supplied by Honorary Crop Correspondents are constantly under review. It is evident that the number of Honorary Crop Correspondents reporting on the various crops will have to be increased above the present level of 700, and it is intended to proceed with this as opportunity permits.

A start has been made on changing the size and distribution of the sample of growers for the grain and seed crops, but large areas of the grain belt still remain to be covered. During the year the number of farmer correspondents reporting on the peanut crop was increased and forecasting methods adjusted. Changes have also been made in the basis of potato crop forecasts, but a larger and more consistent sample is still needed.

The Branch at present issues forecasts on 11 crops—wheat, barley, oats, canary seed, linseed, grain sorghum, maize, White French millet, setaria (panicum), potatoes and peanuts. In addition quarterly reports on the poultry industry are issued.

Another publication is the *Monthly Report on Production Trends*, which gives a progressive coverage of conditions in primary industry throughout the State.

The growing importance of the export market for grains led to the need for the grain marketing boards and grain growers to have better information on overseas prices and supplies. From reports regularly received from overseas the Branch now compiles *Grain Abstracts*, which give essential data in summarised form.

Growers of fruit, vegetables and farm produce are vitally interested in the prices obtained for their produce and in market trends. Other interested parties are buying organisations, public institutions and packing houses. This information is broadcast daily in the A.B.C. "Country Hour" and other radio programmes, and is also disseminated by the Press and by the Department.

The *Daily and Weekly Market Reports* on which this information is based are compiled by Market Reporters of the Marketing Branch. These officers are in daily attendance at the Brisbane Wholesale Fruit and Vegetable Markets and at the Roma Street Auction Sales. Reports on the markets at Cairns, Townsville and Rockhampton, which are prepared by local officers of the Division of Plant Industry, are also included. For

the past 12 months the official Market Price Reports have also included information supplied by the Fish Board.

Officers of the Marketing Branch gave three radio talks, and submitted seven articles for publication in the *Queensland Agricultural Journal*. In addition, material was prepared for the Agricultural Supplement of the *Courier-Mail* and for the Department's *News Bulletin*, which is circulated to Press and radio.

GENERAL.

In April 1957, the Primary Producers' Organisation and Marketing Acts were amended to enable the inspection powers of boards set up under the Acts to be extended from time to time by Order in Council. During the year under review these powers were extended to the Barley, Egg, Grain Sorghum, and Peanut Marketing Boards. Similar powers were extended to the State Wheat Board by proclamation under the Wheat Pool Acts.

Marketing Board Elections and Referenda.

During the year ballots were conducted in connection with the election of growers' representatives on a number of marketing boards. The election for the Tobacco Leaf Marketing Board was for the usual triennial term of office. By-elections were held during the year to fill vacancies on the Peanut Marketing Board, the Butter Marketing Board and the Cheese Marketing Board. Following a petition to the Minister from onion growers, preliminary steps were taken to prepare a marketing scheme for submission to the Governor-in-Council and to the growers.

Wheat Stabilisation.

The present Commonwealth-wide Wheat Industry Stabilisation Scheme will finish with the 1957-58 season. During the year preliminary action was taken for the renewal of the scheme. Negotiations took place between growers and the Commonwealth Government, and the subject was discussed in the Australian Agricultural Council between State and Commonwealth Government representatives.

AGRICULTURAL ECONOMICS.

The last few years have witnessed a new development in the work of the Marketing Branch. This development was a natural corollary to the situation that followed the checking of the post-war inflation. While prices of farm products tended to fall, farmers' costs continued to rise. In these circumstances, a farmer when considering any changed practice or additional investment needs to be sure that his action will pay. A farm business is, today, such a complex organisation that no longer can one be sure that the "good" farmer, who does all the recommended things, is necessarily making the best use of his resources.

The Marketing Branch was called on for economic advice early in 1956 in connection with a problem on the Atherton Tableland, with reference to a change in cropping practice from row crops to mixed farming. Officers of the Branch investigated the situation and their report showed that although after a few years the income from the farm would improve, there would be an intermediate period when income would, in all probability, actually decline.

In the meantime, the Pineapple Sectional Group of the Committee of Direction of Fruit Marketing asked the Council of Agriculture to conduct a study of the economics of pineapple production. This Department agreed to co-operate with the Council, and the survey made was the major research project of the Branch in 1956-57.

The report on the survey was published early in 1958. It dealt with the relationships between profitability and such things as farm size, the amount of labour available, capital investment, and efficiency ratios such as output per labour unit, yield per acre and cash costs per acre. A significant point that emerged from the analysis was that many pineapple farms in Queensland are on too small a scale for economic efficiency. Release of the report was followed by a number of conferences with industry and Departmental officers to discuss industry policy in the light of the findings of the survey.

During the year the Branch investigated the economics of supplementary irrigated pasture on dairy farms. With the co-operation of the Agriculture Branch, 18 farmers were selected and interviewed. These farmers were located in the Beaudesert, Boonah, Esk, Kingaroy, Gympie and Caboolture districts, and had been growing and feeding irrigated pasture for periods ranging from less than one year to over six years. The investigation was essentially a preliminary one designed to obtain, urgently, some idea of the size of investment necessary to start irrigation pasture, and some indication of the order of costs and returns that might reasonably be expected from the investment. The survey indicated that investment in irrigated pasture, provided that the area is not too small, should be profitable in normal circumstances and should provide, in addition, useful insurance in times of drought.

Capital investment, costs and labour usage vary widely from farm to farm and a typical budgetary situation cannot be taken to apply literally to any particular farm; nor can these brief surveys be expected to consider minor points of variation. The picture they paint is essentially a broad one and is intended only to indicate the results efficient farmers might be expected to achieve under certain conditions.

COMMODITY MARKETING BOARDS.

A detailed description of the activities of the various marketing boards operating in Queensland will, as in previous years, be given in the Annual Report of the Director of Marketing to the Minister for Agriculture and Stock, as required by *"The Primary Producers' Organisation and Marketing Acts, 1926 to 1957."*

PRIMARY PRODUCERS' CO-OPERATIVES.

The 119 primary producers' co-operative associations actively functioning under *"The Primary Producers' Co-operative Associations Acts, 1923 to 1934,"* may be classified as follows:—

Type of Association.	Number.
Fruitgrowers	19
Sugar Mills	8
Cattle/Sheep Dips	36
Butter Factories	12
Cheese Factories	7
Butter and/or Cheese and/or Milk	15
Bacon	3
Wool Selling	2
Flour Milling	1
Miscellaneous	16

The total annual sales turnover of these co-operatives now exceeds £50m. Their fixed assets, in the shape of land, buildings, machinery, plant, etc., approximate £15m., and members' funds, in the form of share and loan capital, total more than £7½m.

A development of importance to the dairying industry in North Queensland was the amalgamation during the year of The Atherton Tableland Co-operative Butter Association Limited and The Evelyn Tableland Dairymen's Co-operative Association Limited. This was effected in order to achieve greater economy and efficiency of operation.

Another event of note has been a merger of the interests of Queensland Co-operative Bacon Association Limited with those of Victorian Bacon Company Limited. The former will eventually wind up as a primary producers' co-operative association, and the shares of the members of both the Queensland Association and the Victorian Company will be exchanged for shares in Australian Bacon Company Limited.

ECONOMICS RESEARCH BRANCH.

Mr. C. H. Defries, Director of Economic Services.

The Economics Research Branch was created in April, 1958, and this report will deal primarily with the proposed nature of the Branch's activities and the work which has been initiated.

The tempo of to-day's commercial conditions makes the conduct of any business more and more complex. Farming is no exception. Post-war technological developments in agriculture and the consequent demand for capital investment together with changing market and price conditions and diminishing margins between costs and prices have all put a premium on business efficiency on the farm. One striking result has been the growing need for accurate facts and figures about the current situation.

There has been a considerable development of economics work in farm management in recent years in overseas countries and the opportunity to study some of these trends in the United States of America and Canada during the year provided a most useful background against which to examine the requirements of the situation here. The trend everywhere is towards greater intensity of production. It is essential to clarify the economic implications of this change if adjustments at the farm, industry or national level are to be effected efficiently and smoothly.

There has been an increasing realisation in recent years that extension workers need factual information concerning the economics of farm practices. The farmer is naturally interested in the results of research in terms of profit and loss, and unless his questions can be anwered in such terms, the extension worker is at a disadvantage.

The work done by the Marketing Branch in recent years in studying the economic structure of the pineapple industry, mixed farming in the Atherton District and irrigated pastures has provided a useful prelude to a more intensive drive for more factual information about the economics of farming practices and of industry situations.

Programme of Investigations.

The new Branch has yet to build a technical staff which will be able to cope with the wide range of economic problems which present themselves. Some projects have been commenced with the assistance of the part-time services of three officers, two from the Marketing Branch and one from the Division of Dairying. These projects, which relate primarily to the grain and dairying industries, are being carried out in collaboration with industry organisations and other Divisions of the Department. Individual industry problems such as the size of the farm business, the nature of investment patterns, risk and uncertainty in seasons and markets, together with the economic implications of improved farm practices, are the focal points at which the greatest attention is being directed.

The studies undertaken represent only a fraction of the field open for enquiry but from them it is hoped to present a much clearer definition of problems than has been possible hitherto and to establish some economic guideposts which may help towards the making of more adequate farm business decisions.

Wheat Industry Survey.

This work is being undertaken at the request of and with the assistance of the State Wheat Board, in collaboration with the Council of Agriculture. The major purpose of this survey is to obtain a fuller understanding of economic trends in the industry and assess the relative significance to the wheat farmer of the crops and/or livestock products associated with wheat growing. There is a considerable variation in the organisation of wheat farms in relation to size, investment pattern and geographical location as well as a great diversity of farming patterns because of the range of enterprises that is possible in wheat growing areas. In this study, an effort will be made to analyse the influence of these factors on economic well-being and trends in the industry. The survey is, therefore, not concerned with obtaining a specific cost of production but with providing an analysis of the structure of the industry and a picture of the type of management problem farmers have to face in the grain areas. Information of this kind can be of great help in the consideration of industry problems. It also provides a necessary background for the more intensive investigation that will be needed to deal with specific problems such as soil erosion, the most profitable combinations of enterprises and the effects of risk and uncertainty on farmers' management decisions.

Dairy Cattle Feeding Investigations.

Two investigations relating to the feeding of dairy cattle have been commenced—one in the Beaudesert district and another in the Warwick district. Both of these investigations are limited in scope. Work in the Warwick district will be designed to test the relative profitability of the four major feed patterns of the Southern Downs, viz.—

(1) Native pasture.
(2) Native pasture plus crops or lucerne.
(3) Native pasture plus crops or lucerne, plus hay, grain or silage during short dry spells.
(4) Native pasture plus crops or lucerne, plus a daily ration of grain and/or hay.

The work at Beaudesert is being carried out in conjunction with the Cattle Husbandry Branch with a group of seven district dairymen who are producing wholemilk during the winter months on an intensive supplementary feeding basis. Each farmer is being assisted to keep a detailed record of costs of feed and returns obtained.

Budgeting Procedures.

In view of the importance of budgeting procedures in examining problems of farm management, a special examination of the application of budgeting is being undertaken with the help of a co-operating farmer. Extension material will be developed from this work to guide farmers and field officers in the keeping of farm records and the preparation of budgets. It is hoped in this way to encourage farmers to maintain their own record systems and to develop more effective and better organised farm plans.

Soil Conservation Economics.

In conjunction with Soil Conservation Officers of the Agriculture Branch, arrangements are being made to assist a group of farmers in the Wooroolin-Memerambi district to keep records of costs incurred in establishing soil conservation practices on their farms. This is a long-term project which could provide a useful basis for detailed economic investigation.

Staff.

Apart from the appointment of the Director there has yet been no formal staffing of the technical part of the Branch. There is a heavy demand in Australia for personnel with training in agricultural economics. Two scholarships were granted during the year, one tenable at the University of Queensland in the Faculty of Economics and Commerce and one at the University of New England (Armidale, N.S.W.), where a full-time 4-year course in Agricultural Economics was instituted this year.

General.

A number of radio talks and articles have been prepared to explain the nature of the work proposed by the new Branch. A series of 15 lectures on farm management is being given at the Queensland University to students in the Faculty of Agriculture and to members of the public. These are being published by the University at the conclusion of the course.

STANDARDS BRANCH.

Mr. A. A. Ross, Standards Officer.

The prolonged drought throughout the larger portion of the State exerted its effects on the activities of the Standards Branch, especially with respect to the demand for stock foods of all kinds and the standards of many of the fruit crops.

The work of all sections of the Branch has expanded somewhat since last year, the most spectacular progress being made in seed certification and inspection under the Agricultural Standards Act. The quantity of grain sorghum seed certified was more than double that of the previous year and a beginning was made with bulk handling of the harvesting and cleaning of this crop. The first certified buffel grass seed was produced during the year and investigations are proceeding into ways of improving mechanical harvesters and cleaning machines in order to bring the price of this seed down to a level which will permit its general use on extensive areas of grazing land.

The staff of Inspectors (Agricultural Standards) extended their services to the northern and western portions of the State, thereby covering territory which had not received attention for over two years.

A list of fertilizers and liming materials registered for sale in Queensland in accordance with "*The Agricultural Standards Act of* 1952" was prepared for publication by the Registration Section.

SEED TESTING.

The volume of work performed by the Brisbane Seed Testing Station showed an overall increase of 15.3 per cent. over the previous year's output in the number of samples tested. Seed samples submitted by inspectors of the Branch and collected in their routine check on seed quality increased from 1,902 to 3,361, due to the more complete coverage given to country seed stores this year. The number of samples submitted by seed merchants increased by 565, a tribute to the importance they attach to this service. This increase has taken place despite a rise in the rate of fees from July 1 last. There was a decrease in the number of samples of seed tested for certification, while the total quantity of seed certified increased substantially. This is accounted for by the greater bulk represented by each sample and also by fewer re-tests being conducted following treatment of the seed.

TABLE 1.

SUMMARY OF SEED SAMPLES EXAMINED.

Source of Samples.	1956–57.	1957–58.
Inspectors of the Branch ..	1,902	3,361
Seed certification	322	189
Experimental projects	315	240
Submitted samples—		
(1) Merchants	6,736	7,301
(2) Farmers	110	175
(3) Government Departments	819	499
Total	10,204	11,765

SEED CERTIFICATION.

Certified grain sorghum seed production in the 1957 season showed a sharp increase due to high yields per acre and the fact that all seed harvested conformed with certification requirements. Bulk handling equipment has been installed at Mt. Tyson for the harvesting and cleaning of one of the grain sorghum crops for certification. The procedure adopted will be subject to review later but at present it appears that this method of seed handling will prove to be a decided advantage as it considerably simplifies the handling of the seed and, in addition, will reduce the grower's production costs.

Adequate precautions have been taken at all stages during bulk handling to ensure that contamination of the seed does not occur and that the high standards for certified seed are maintained.

In the case of certified tomato seed, there has been a fourfold increase over last season's production, due chiefly to increasing demands for certified seed and to low returns for fruit, which induced seed producers to divert a larger proportion of their crops to seed production.

The quantity of hybrid maize seed certified in the 1957 season was sufficient to meet requirements. Very little of that harvested failed to comply with certification standards. Of the seed certified, 96.4 per cent. germinated in the range 90–99 per cent. and the remainder 80–89 per cent. It was planned to produce approximately 10,000 bushels during the 1957 season to meet normal requirements and this objective was achieved. The drying plants installed by two of the largest producers of certified hybrid maize seed have proved very successful, but the season did not prove difficult in this respect.

Certified bean seed production also showed an increase despite the rejection of a number of crops due to the presence of bacterial blight. A seed drying plant has been installed by the Committee of Direction of Fruit Marketing for treating certified bean seed of which the moisture content is above the optimum for satisfactory storage. Two rust-resistant varieties, Redlands Beauty and Redlands Belle, recently developed by Departmental plant breeders, have been approved as varieties for certification and the first seed of these has been produced ready for pre-certification cleaning.

The production of certified buffel grass seed is proceeding according to plan and approximately 1¼ tons of the Gayndah strain have already been certified. It is anticipated that the first harvest of Biloela buffel grass seed will be presented for certification in the near future.

The production of certified sweet sorghum and sweet Sudan grass seed has declined slightly. It appears that there is a limited market for these seeds. Further, their harvesting presents certain practical difficulties.

TABLE 2.

PRODUCTION OF CERTIFIED SEED.

Crop.	1955.		1956.		1957.	
	Certified.	Refused.	Certified.	Refused.	Certified.	Refused.
Hybrid Maize (bus.)	3,336½	381	9,921	62	10,454	75
Grain Sorghum (bus.)	12,403	4,287¾	12,461	7,136½	29,476½	..
Sweet Sorghum (bus.)	448½	301	1,395¾	7¾	552½	..
Sudan Grass (bus.)	71⅝	814	1,182	305	401	429
French Bean (bus.)	135½	11½	63	..	129½	28
Tomato (lb.) ..	107½	8⅝	165½	..	621½	..

INSPECTION—AGRICULTURAL STANDARDS.

Inspectional activities were intensified somewhat during the year and visits were paid to 146 towns, including Cunnamulla, Charleville, Longreach and Blackall in the west, Thargomindah, Goondiwindi and Wallangarra in the south or south-west, and Cooktown, Chillagoe and Laura in the far north. Some places were visited for the first time on record. The only area not yet serviced is that from Hughenden westward along the Great Northern railway, but this will be covered in the near future. A total of 840 sellers of agricultural requirements was visited or re-visited.

Seeds.

As Table 3 indicates, 6,190 bags of seeds were cleaned under supervision of inspectors. Of these, 5,331 were bags of velvet bean seed being imported from South Africa, cleaning being necessary because of the

presence of maize seed, which is a prohibited material under the Commonwealth Quarantine Regulations. As a consequence, importers suffered losses, deliveries to farmers were delayed and cost of seed was increased.

In addition to the quantity cleaned, 775 bags of agricultural crop seed and almost half a ton of vegetable seeds in bulk were either destroyed or converted to stock food.

TABLE 3.

ACTION TAKEN ON UNSATISFACTORY SEEDS.

—	1956–57.	1957–58.
Agricultural crop seeds cleaned under the supervision of an inspector	2,005 bags	6,190 bags
Destroyed or otherwise rendered unsuitable as seed—		
(i.) Agricultural crop seeds	145 bags	60 bags
(ii.) Vegetable seeds ..	350 lb.	364 lb.
(iii.) Packeted seeds ..	315 pkts.	697 pkts.
Processed for stock food—		
(i.) Agricultural crop seeds	761 bags	715 bags
(ii.) Vegetable seeds ..	..	696 lb.

Material Other Than Seeds.

The special attention given to inspection of stock foods, fertilizers, limes, pest destroyers and veterinary medicines in 1956-57 was maintained and in some instances intensified in the year under review. Table 4 summarises action taken on materials other than seeds. Whereas 480 samples of these materials were taken by inspectors in the previous year, this figure rose to 780 during the current period, comprising 90 fertilizers, 5 limes, 126 pest destroyers, 61 veterinary medicines and 498 stock foods. With the exception of stock foods the quality of preparations represented by the samples was generally good. In those cases where deficiencies occurred, action was taken to ensure that such deficiencies were corrected and not repeated. Of 498 samples of stock foods obtained by inspectors, 351 were analysed in the Chemical Laboratory. The balance consisted of grain, hay, chaff, etc., examined by Standards Branch staff to determine presence of harmful ingredients prescribed under the Agricultural Standards (Stock Foods) Regulations. Of the samples of stock foods analysed in the Chemical Laboratory, deficiencies were indicated in 127, but it is interesting to record that as the year proceeded and the intensified campaign on the standard of stock foods began to have effects, the number of deficiencies decreased until in the last quarter of the year only 4 samples of a total of 105 were found to be deficient.

While it was expected, in accordance with past experiences, that many growers would take the opportunity provided by drought conditions to dispose of poor quality fodders, it was noticeable that the quality of hay and chaff on offer at daily auctions at Roma Street was reasonably good on the average. In almost every case, this produce originated in irrigated areas. There were several farmers who endeavoured to take advantage of the situation, but as indicated in Table 4, 339 trusses of hay were seized and 285 of these were destroyed by burning. One consignment was found to be a mixed lot from different cultivations and permission was given to separate good from bad, with the result that 54 trusses were released.

TABLE 4.

SUMMARY OF ACTION ON MATERIALS OTHER THAN SEEDS.

	1956–57.						1957–58.					
	Fertilizers.	Lime.	Pest Destroyers.	Veterinary Medicines.	Stock Foods.	Total.	Fertilizers.	Lime.	Pest Destroyers.	Veterinary Medicines.	Stock Foods.	Total.
Samples received from—												
Inspectors	61	..	66	13	340	480	90	5	126	61	498	780
Buyers	..	..	..	..	7	7	..	..	..	..	7	7
Seized	..	59 (*a*)	..	..	147 (*a*)	206 (*a*)	983 (*a*) 44 (*b*)	..	622 (*b*)	9 (*b*)	529 (*a*) 23 (*b*) 339 (*c*)	..
Reconditioned, relabelled or deficiency rectified	..	59 (*a*)	..	..	147 (*a*)	206 (*a*)	983 (*a*)	..	611 (*b*)	..	529 (*a*) 54 (*c*)	..
Destroyed	..	..	..	..	..	..	23 (*b*)	..	55 (*b*)	9 (*b*)	18 (*b*) 285 (*c*)	..
Withdrawn from sale ..	..	..	..	..	24 (*b*)	24 (*b*)	..	..	31 (*b*)	..	..	31 (*b*)

(*a*) Bags. (*b*) Packages, tins or bottles. (*c*) Trusses of hay.

REGISTRATION.

The number of applications for the registration, re-registration or extension of registration of agricultural requirements rose from 2,649 to 2,920.

The Agricultural Requirements Board held 20 meetings and considered the claims made by manufacturers regarding the efficacy of 682 preparations for which applications for registration or re-registration had been received. Of these preparations, 407 were veterinary medicines and 275 pest destroyers. On the recommendation of the Board, 1 veterinary medicine and 13 pest destroyers were refused registration.

All pest destroyer preparations were reviewed during the year, as a 3-year registration period for such preparations commenced in February. As a result of knowledge obtained from Departmental trials with the newer chemicals, alterations to the labels of a number of preparations, particularly fungicides, were required.

The past year saw the introduction to Queensland of copper pentachlorphenate for control of snails, which are an intermediate host of liver fluke, a sheep parasite. A new grass killer, 2,2-dichloro-propionic acid (dalapon), was also introduced. Molasses is now being processed as dehydrated molasses and is used as a base for stock food concentrates containing minerals and vitamins. One such preparation is now registered in Queensland. In the veterinary medicine field, dimethyl-hydroxy-trichloroethyl-phosphate under the trade name of Neguvon is now being marketed for the control of certain worms in sheep and cattle.

An exhibit was prepared for the 1957 Royal National Exhibition showing how registration of agricultural chemicals is a factor in ensuring that products of this nature offered for sale in Queensland are of high quality.

IMPORTS AND EXPORTS.

There was a slight decrease in the amount of seed imported during the year, due mainly to reduced loadings of velvet beans. As mentioned earlier, much of this had to be cleaned of maize seed; it had also to be dusted to guard against the introduction of kernel smut disease suspected of being carried on the maize.

Several consignments of centro seed received from Malaya were found on examination to contain seeds of giant sensitive plant (*Mimosa invisa*). All such consignments were cleaned before release for sale. To

Plate 1.—The Standards Branch Display at the Brisbane Show, 1957.

provide against the introduction of this weed through other States, steps were taken to have *Mimosa invisa* proclaimed a prohibited entry under the Commonwealth Quarantine Regulations.

TABLE 5.

IMPORTS—SEED FOR SOWING.

	Bags.
Agricultural Seeds—	
Centrosema	17
Clover	47
Mangel	11
Rape	109
Turnip (field)	42
	226
Grass Seeds—	
Paspalum notatum	12
Ryegrass	25
	37
Velvet Beans	6,397 bags.
Vegetable Seeds—	Lb.
Beet	488
Cabbage	89
Carrot	195
Cauliflower	23
Cucumber	303
Lettuce	96
Marrow	98
Melon	147
Pumpkin	12
Radish	31
Swede	248
Turnip (garden)	13
Vegetables (miscellaneous)	14
	1,757
Peas	129 bags.

The exports of small grains to the United Kingdom and Continental markets was again very considerable. White French millet was the most common of these. Some concern is being shown by certain exporters with respect to the quality of these grains for export. A sizeable proportion of the Queensland crops is of low grade because of the high content of dehulled grain and the occurrence of buff and grey seeds has also lowered the grade of French millet. Export standards for these grains have not been gazetted, as merchants have shown a preference for operating under a contract system with the London Corn Trade Association.

TABLE 6.

EXPORTS—GRAINS AND SEEDS.

	Samples.		Bags.
White French millet	537	representing	183,688
Setaria (Panicum)	225	representing	44,872
Canary	261	representing	41,180
Grasses—			
Axonopus	3	representing	3
Molasses	5	representing	11
Paspalum dilatatum	47	representing	3,907
Rhodes Grass	10	representing	676
Beans	2	representing	2
Centrosema	2	representing	2
Cowpeas	36	representing	7,361
Japanese millet	6	representing	1,294
Maize	3	representing	3
Peanuts	91	representing	5,567
Safflower	19	representing	6,344
Sunflower	27	representing	1,583
	1,272	representing	296,491

(10 samples of White French millet were found to contain Datura.)

INSPECTION—FRUIT AND VEGETABLES.

The continued drought in horticultural districts had the effect of reducing fruit size, particularly of the early varieties of deciduous fruit.

The regulation governing grade standards for pumpkins was amended to define clearly the various sizes. The maturity standard for avocadoes was amended by adopting a minimum oil content of 15 per cent. for the Fuerte variety.

During the year, the New South Wales Department of Agriculture decided to discontinue inspection of fruit and vegetables passing from Queensland to that State by road and rail transport. As a consequence, inspectors previously engaged on this work at Wallangarra and Clapham were transferred to Brisbane, where there was an acute shortage of inspectors.

The amount of fruit and vegetables inspected at the markets was approximately the same as in the previous year, but condemnations were generally lighter, probably because of a lower incidence of disease under the dry weather conditions.

CLERICAL AND GENERAL DIVISION.

Mr. W. T. GETTONS, Assistant Under Secretary.

Mr. H. BARNES, Special Administration Officer.

The Department of Agriculture and Stock is organised into five divisions. The Clerical and General Division provides the clerks, clerk-typists, accountants, transport officers and miscellaneous workers necessary to a Department with a staff of 1,235 and with offices throughout the State.

The division also takes a part in activities not especially allotted to the production and marketing divisions, such as information services and matters arising under the Farm Produce Agents Acts and Abattoirs Acts.

STAFF.

The staff of the Department at June 30, 1958, totalled 1,235, an increase of 57 over the number employed at June 30, 1957. Of this increase, 10 were clerical workers.

The clerical staff numbers 228, comprising 98 males and 130 females, as follows:—

—	Brisbane.	Country.	Total.
Clerks	87	2	89
Clerk-Typists	68	56	124
Male Assistants	8	1	9
Female Assistants ..	5	1	6
Total	168	60	228

At June 30, 18.46 per cent. of the Department's staff were clerical workers, compared with 18.42 per cent. a year earlier; 69 per cent. of the permanent male clerks occupy classified positions.

It is the practice where warranted to provide clerical assistance in country centres to relieve extension officers of routine clerical work and thus enable them to spend maximum time in the field. Another advantage of this system is that it enables the country office to be open to the public during all regular working hours. Country offices in 38 centres have clerical assistance.

ACCOMMODATION.

With increasing activities of the Department the matter of providing suitable and adequate accommodation for Departmental officers continues to be a problem.

It is anticipated that the Bureau of Sugar Experiment Stations will be entering into occupation of its own building towards the end of 1958. Consideration is now being given to the re-allocation of the space at present occupied by the Bureau. The additional accommodation which will become available will afford some degree of relief from the existing overcrowding.

The new Court House at Bundaberg has been completed and officers of the Department have moved into the rooms allocated to them. Departmental services will also benefit from extensions to the Court House at Kingaroy, which are nearing completion, and from extensions planned for the Court House at Emerald. At Dalby some relief has been obtained by the provision of temporary accommodation in a building at the rear of the Court House. The building at Bowen which was occupied by the Department was destroyed during the cyclone. Departmental officers are now accommodated at the Court House. A lease has been obtained of the whole of the first floor of Zapulla's Building at Cairns. This provides more adequate accommodation than was available in the Government building where the Department was formerly located. More suitable premises have been leased at Beenleigh, while extensions have been obtained to the leases of premises in Inglewood and Wowan.

ACCOUNTS.

Payments from all Funds totalled £3,768,662. compared with £2,605,818 for the previous year. Receipts increased by £1,282,382 over 1956-57.

The increases were due mainly to the payments made, and the reimbursements received, in connection with the facilities for the bulk handling of sugar. Most of the services offered by the Department are free, and where charges apply they are kept reasonably low as an encouragement to producers to use these services, which are provided for their benefit.

TRANSPORT.

During the year a total of 40 vehicles was purchased. Of this total, 31 were to replace vehicles which had given considerable service and could no longer be operated economically, and six were purchased to replace privately owned vehicles which were no longer available for official purposes.

Three of the new vehicles were purchased from the Commonwealth Extension Services Grant, one from the Commonwealth Dairying Industry Extension Grant and one from the Tobacco Industry Trust Account.

During the year 38 vehicles were sold and one vehicle was totally destroyed by fire. Six vehicles are held awaiting disposal.

At present the Department operates a fleet of 283 vehicles. In addition, a total of 303 officers operate their private vehicles for official purposes on a mileage basis.

EXTENSION CO-ORDINATION.

As reported previously, steps were taken in 1954 to provide specialised training in extension methods for extension personnel of all Divisions and to co-ordinate various other aspects of the Department's extension services, such as publications, publicity, broadcasting, motion picture production and photography.

During recent years, three senior officers of the Department had made separate studies of different aspects of extension in the U.S.A. and other overseas countries. On the return of the last of these officers in December, 1957, a series of conferences was held for the purpose of recommending the most appropriate and practical form of organisation of Departmental extension services and means of improving the operation of those services. A plan has now been accepted and will be brought into operation as circumstances permit.

Induction and in-service training of extension officers in extension methods and their use have been pursued during the year. New officers were given a short course in extension where the opportunity arose. It is intended to ensure that all new officers receive appropriate instruction at an early stage in their service so that they will be better equipped to deal with extension problems in their districts.

Two 15-day in-service schools in extension methods were conducted during the year, the total number of officers receiving training being 58. There are still a large number of officers who have not been through an extension training school, but schools are being held as often as possible. Officers who have not yet attended a school have been provided with study material on various aspects of extension.

A member of the staff had the opportunity of taking an advanced course in extension education at Cornell University in the U.S.A. Commonwealth funds were secured to enable the officer to pursue the course. On completion of the course he entered upon a short period of field work with various State extension services in the U.S.A. The special studies undertaken by this officer will be of benefit to the extension service in the training field particularly.

PUBLICATIONS.

The circulation of the Department's monthly advisory publication for farmers, the *Queensland Agricultural Journal*, was 13,000 at the end of the year. This was a decrease of about 10 per cent., which could be attributed to the increase in the subscription rates to both farmers and others and to the drought that occurred during the year.

It is anticipated that increase in the variety and scope of the journal's contents may assist to retrieve the lost circulation.

A total of 67 articles that appeared in the journal have been reprinted as advisory leaflets or pamphlets, aggregating more than 110,000 copies. These articles had their origin in the Division of Animal Industry (27), Division of Plant Industry (25), Division of Dairying (13), and Division of Marketing (2).

Progress was made during the year with the revision of the Queensland Agricultural and Pastoral Handbook series. Final material for the voluume dealing with horticulture was edited and supplied to the Government Printer, so that the reprinting of this volume is now in sight. Concurrent with this work was the preprinting of much of the material in leaflet and pamphlet form.

A publication on the honey flora of Queensland that was complied from a series of articles in the Journal went to press. A special publication dealing with the main weeds of Queensland was issued.

The provincial Press continued to make wide use of the Department's weekly *News Bulletin*. This bulletin carries topical advisory items for primary producers and is sent to nearly 100 newspapers and radio stations. Newspapers used the items regularly and they were especially well displayed in those newspapers publishing a weekly "farmers' page". In addition, a summary of each of the three weekly items was widely circulated over the A.B.C.

Use of the Press as an extension medium was enlarged by supplying special feature articles to selected newspapers. There was a favourable response to these illustrated features by newspaper editors, and so far there has been no difficulty in getting them placed.

News items on the general activities of the Department were released to the Press and radio almost daily.

RADIO.

The central broadcasting service supplied taped extension talks regularly to most of the country radio stations and these were widely used. In areas where local officers provide special radio sessions, the taped talks supplement these sessions. The sessions operated at Toowoomba, Warwick, Gympie and Kingaroy. The Warwick session is a night one; the others are daytime sessions.

PHOTOGRAPHIC SERVICES.

Seven hundred and fifty orders for work required by every Branch of the Department and some for other Government organisations were completed by the Photography Section during the year. This entailed the production of over 18,000 prints of all sizes and covering a wide range of subjects. A large proportion of the prints was prepared from negatives taken in the field by officers all over the State. There is a steadily growing demand for colour slides of technical subjects for use as visual aids at field days and organised gatherings of primary producers. In addition, over 600 colour photographs of specimens and equipment have been taken in the Studio by the photographic staff.

A central film library which presently consists of 48 optical sound 16-mm. movie films, both in colour and in black and white, has been established and is being added to as films become available. The films are loaned to field officers for showing at farmers' meetings and have proved to be an important extension medium.

Equipment available for the making of movie films is being added to from funds provided by the Commonwealth Extension Services Grant. Increasing use of this equipment is being made by Branches to record in movement and colour agricultural subjects where the aspect of animation is important.

Work is in progress on the production of three full-length films for the Agriculture, Dairy and Poultry Branches. A considerable footage on certain aspects of papaw production has been shot for inclusion in a film on the papaw industry being prepared by the Committee of Direction of Fruit Marketing.

CENTRAL LIBRARY.

The Central Library has accumulated an extensive collection of valuable reference books and journals from all over the world relating to various aspects of the agricultural and animal industries. It is thus possible to refer to past and current research and experimental work at home and aboard on almost any problem which arises. Periodicals are purchased from or exchanged with many authorities and these are circulated as received to appropriate officers at Head Office and in the country.

Inter-library borrowing is also carried on and is in considerable demand. Publications are loaned to other libraries on request and others are borrowed as required.

LOCAL ABATTOIRS.

Under "*The Abattoirs Acts*, 1930 *to* 1949," there is authority for the establishment of centralised slaughtering of livestock. The objectives of centralised slaughtering are to have the meat supply treated at well-equipped works where operations can be at all times under the supervision of Government inspectors, and to have the by-products used to the best advantage.

Local Abattoir Boards are constituted to provide facilities in the main centres of population. All the members (except one) of a Local Abattoir Board must be members of the Local Authorities whose areas are served by the Abattoir. The additional member may be nominated and appointed by the Government. If the Board desires the appointment of such additional member, the Government appoints a man who is well versed in abattoir matters so that the Board will have the benefit of his experience. The establishment and maintenance of the Local Abattoir is thus in the hands of the community through their elected representatives—the Aldermen and Shire Councillors. The Department has continued to give the Local Abattoir Boards considerable assistance with their work, and the Government has guaranteed repayment of the loans raised for the building of the Local Abattoirs.

Under the Acts, the Local Abattoir Board may provide slaughtering facilities by entering into an agreement with the owner of an established works to have its livestock requirements slaughtered under contract. So far no agreement of this nature has been made.

Boards have been constituted for Local Abattoir Areas at Toowoomba, Ipswich, Bundaberg, Rockhampton, Mackay and Townsville.

Local Abattoirs are operating at Toowoomba, Bundaberg and Townsville. Construction of the Ipswich Local Abattoir is nearing completion. The Rockhampton Local Abattoir Board is not functioning while investigations are proceeding as to the need or desirability of providing public abattoir facilities in Central Queensland. The Mackay Local Abattoir Board has carried out work at the abattoir site at Baker's Creek.

FARM PRODUCE AGENTS ACTS.

Under "*The Farm Produce Agents Acts*, 1917 *to* 1932," supervision is exercised over farm produce agents in their dealings with their principals.

During the year the books and records of a number of agents were checked to verify that compliance was made with the Acts and that consignments were being accounted for correctly.

Any person who has consigned farm produce to a farm-produce agent for sale on commission has the right to inspect and check copies of all entries relating to the receipt and sale of such produce with agents' books. The consignor may authorise another person to make the inspection. At the request of growers, inspections were made during the year and they were advised of the result of the inquiries.

There are 129 licensed farm produce agents in Queensland, and of these 76 are in the Brisbane area.

By Authority: S. G. Reid, Government Printer, Brisbane.